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# **Zero Waste Education: An evaluation of an environmental education programme**

A thesis  
submitted in partial fulfilment  
of the requirements for the degree  
of  
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## **Abstract**

The Ministry of Education's *Guidelines for Environmental Education in New Zealand Schools* (1999) names five aims of what environmental education should achieve in New Zealand. These aims are for students to develop: "awareness and sensitivity to the environment and related issues; knowledge and understanding of the environment and the impact of people on it; attitudes and values that reflect feelings of concern for the environment; skills involved in identifying, investigating, and problem solving associated with environmental issues; and a sense of responsibility through participation and action as individuals, or members of groups whanau, or iwi, in addressing environmental issues" (Ministry of Education, 1999, p. 9).

The research reported in this thesis describes the evaluation of the Zero Waste Education (ZWE) programme against these aims, as well as the goals of the programme itself. The ZWE programme is based in Tauranga and operates in primary schools around New Zealand delivering waste education to students.

This research was conducted within the interpretivist paradigm. Data was collected using the case study method in one school in the Bay of Plenty, New Zealand, through interviews, parent questionnaires, student questionnaires, observations, and a focus group. Participants in this case study were students who had gone through the ZWE programme, their teachers and other members of the school staff, the ZWE educator, and the parents of the students who went through the programme. Data was organised by initially transcribing interview data, entering student questionnaire and parent questionnaire data into MS Excel spreadsheets and typing observational data. The organised data was then coded in a deductive approach based on the desired outcomes of EE and ZWE, and analysed for common themes that emerged in relation to these outcomes.

The findings of this study indicate that the ZWE programme appears to be meeting its desired goals in general terms, as well as those of environmental education as a whole. The findings appeared to show a raise in student's knowledge of composting and worms, as well as a raise in attitudes and awareness towards the waste issue. The findings also appeared show a level of intergenerational transfer and action taking occurring, with a few participating households reporting a change in their waste management practices and teachers commenting on observed actions of the students.

One key recommendation to emerge from this study is for ZWE to further tighten its goals and discuss these with educators in order to enhance consistent achievement of the goals. Another

recommendation discusses ways to further develop the action taking skills of participating students through the action competence approach and to ensure that these action taking skills have enough of an impact to last in the long term.

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# Chapter 1 Introduction

## 1.1 Overview of the Chapter

This chapter introduces the research. In this chapter the introduction to the study and the aims of the study are defined. The research questions and the significance of the study are then discussed. The chapter ends with an overview of the rest of the thesis.

## 1.2 Introduction

Environmental education is a field of education which has been building momentum since the first round of intergovernmental meetings that addressed worldwide environmental degradation in the 1960's and 1970's. In New Zealand environmental education has developed from ideas in these conferences, and the release of the *Guidelines for Environmental Education in New Zealand Schools* (Ministry of Education, 1999) was a step forward for the field, as well as the introduction of the Enviroschools programme in 1993 that advocates for a whole school approach to environmental education (Eames & Cowie, 2004). Environmental education is taught in schools by classroom teachers, but there are also education programmes that operate independently to deliver environmental education messages in schools. This thesis sought to evaluate one of these latter types of programmes.

The environmental education programme that this thesis focused on evaluating is called Zero Waste Education. Zero Waste Education (ZWE) operates in Tauranga, New Zealand, and has educators around the country that deliver its messages in schools. Its educational messages are focused around reducing, reusing and recycling waste, as well as water and natural resource conservation. Waste education, like that delivered by ZWE, falls under the broad umbrella of environmental education.

Within New Zealand, the need for waste education has been addressed through a number of documents. Firstly, the *Guidelines for Environmental Education in New Zealand Schools* specifically states issues that schools can consider for environmental education. Included in these issues are reducing solid waste and litter, as well as waste management at a national level (Ministry of Education, 1999). The idea of waste education is mentioned in the New Zealand Curriculum as well, as teachers are urged to explore the "long term impact of social, cultural, scientific, technological, economic, or political practices on society and the environment"

(Ministry of Education, 2007, p. 39), which the issue of effective waste management strategies directly relates to.

Furthermore, the Waste Minimisation Act 2008 states that educational activities are effective methods for achieving successful waste management and minimisation outcomes (Ministry for the Environment, 2008). The New Zealand Government's Environment 2010 strategy also discusses waste management as a goal to be achieved through promoting education for the environment (Ministry for the Environment, 1995). This report specifically mentions contamination from landfills, as well as air pollution as environmental threats (Ministry for the Environment, 1995).

This study was undertaken with a personal aim of examining the practice of EE in schools, and I contacted ZWE to discuss research needs. Bruce Trask, the director of Zero Waste indicated his interest in having his programme evaluated formally. Examining this opportunity, it became apparent that relatively few formal evaluations of environmental education programmes have been carried out in New Zealand, and this became a worthwhile opportunity to both provide some evaluative feedback to ZWE and to contribute to broader evaluation outcomes in the field of environmental education.

### **1.3 Aim of the Study**

The aim of this study was to explore the pedagogical elements of environmental education that contribute to successful implementation of environmental education programmes and use this knowledge to further establish understandings of methods in the field of evaluation in environmental education. Furthermore, another aim of this study was ultimately to benefit Zero Waste Education in understanding the effect of their programme in schools.

### **1.4 Research Questions**

The questions that I used to guide the evaluation were:

1. How do the intended aims/goals of the Zero Waste Education programme align with those of environmental education?
2. How do the outcomes of the Zero Waste Education programme support the goals of environmental education?

## **1.5 Significance of the Study**

This research is significant because the Zero Waste Education programme has been operating for over 20 years but has never undergone a formal evaluation. The thesis gives detailed information on how the study was carried out that ZWE may find valuable to put to use to plan evaluations in the future.

Another use of the study could be to inform programme planners and teachers of evaluation methodologies for small scale environmental education programmes. It will also benefit our understanding in the field of evaluation in environmental education within a New Zealand context.

## **1.6 Thesis Overview**

This thesis is organised into four further chapters.

Chapter Two provides a background on current academic thinking around what environmental education aims to achieve, theory and limitations behind programme evaluation, as well as the current context in New Zealand that ZWE is working in.

Chapter Three is a detailed framework for the study and in this chapter the research methods are described. This explains the case study design chosen for the research as well as addressing quality research issues, and discusses the instruments used for the data collection.

Chapter Four presents the findings of the study. The chapter begins by describing the goals of the programme and then key findings are presented regarding how these goals align with the aims of environmental education and how these goals translate into practice in one school.

Chapter Five discusses the research findings, and considers the implications of the research for the ZWE programme as well as offering final suggestions for evaluations in environmental education.





## **Chapter 2 Literature Review**

### **2.1 Chapter Overview**

This chapter documents a summary of the current literature that supports the ideas related to this evaluation. One key idea summarised is the history of environmental education (EE) both internationally and in New Zealand. The goals of EE as a field both in policy and pedagogical strategies are explored, and the role of evaluation in educational research and EE is also explored. The chapter ends with a look at some past evaluations in EE and the analytical framework used in the study.

### **2.2 Environmental Education in Schools**

#### **2.2.1. History of Environmental Education**

##### **2.2.1.1 International History**

Environmental education (EE) has a relatively short history as a school subject worldwide. The term 'Environmental education' is thought to have first been mentioned by Thomas Prichard in 1948, when he identified a need for education of the natural and social sciences (Daudi & Heimlich, 2002b). However, environmental education began to gain momentum in the 1960's and 1970's when concerns arose about worldwide environmental degradation (Bolstad, 2003). From these concerns came a number of major conferences that sought to define environmental education as well as to discuss the nature of the subject (Gough, 1993). While the following major events are not the only historical developments in environmental education, they are major conferences that the history of environmental education has been characterised by.

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) held a number of international conferences which addressed the issue of environmental degradation and promoted education around the issue (Bolstad, 2003). The first of these conferences was in 1975, with the *Belgrade Charter* being developed, which highlighted the goal of environmental education to develop informed and concerned citizens worldwide who are able to work on solutions to current environmental problems and to prevent future ones (Daudi & Heimlich, 2002a).

Subsequently, in 1977 the first 'Intergovernmental Conference on Environmental education' was held in Tbilisi (Martins, Mata, & Costa, 2006). From this conference came the *Tbilisi Declaration*, which "established a framework, principles, and guidelines for environmental education"

(Bolstad, 2003, p. 11). This report outlined five objectives of environmental education as being awareness of the environment, knowledge and first-hand experience of the problems, attitudes of general concern, skills to identify problems, and participation to resolve the problems at hand (Bolstad, 2003). Following this came the *Brundtland Report* in 1987, which highlighted the urgency of the need for action to combat environmental catastrophes (McChesney, 1991). This report focused on taking a new approach to our environment and development for humans in a sustainable way (World Commission on Environment and Development, 1987). In essence, the *Brundtland Report* set a challenge to determine how to achieve sustainable development, and how to go about doing it effectively (McChesney, 1991).

Another important conference called the Earth Summit was held in Rio de Janeiro in 1992, and from this conference the document titled *Agenda 21* was developed, which had a very strong emphasis on education as a way forward (UNCED, 1992). *Agenda 21* focussed on using the *Tbilisi Declaration* recommendations and the *Brundtland Report's* ideas of development to call "for the re-orientation of environmental education towards 'education for sustainable development'" (Bolstad, 2003, p. 11). As well as changing focus towards education for sustainability, *Agenda 21* also aimed to promote integration of environmental concepts in all educational programmes and called for more emphasis on "the further training of decision makers at all levels" (UNCED, 1992, p. 2).

Since the Earth Summit in 1992 there have been two conferences to mark the anniversaries of this conference and to provide future direction, Rio +10 and Rio +20 (Horn, 2012; Steiner, 2003). Rio +10 was held in 2002 in Johannesburg, and from this conference came two main documents, the *Plan of Implementation* and the *Johannesburg Declaration on Sustainable Development* (Steiner, 2003). The *Plan of Implementation* was designed as a 'framework to action' for issues such as poverty eradication, sustainable consumption and production, protecting and managing resources, and sustainable development (Steiner, 2003). Furthermore, the *Declaration on Sustainable Development* was a reinforcement of the existing challenges and commitment to sustainable development (Steiner, 2003). Overall, the conference was felt to have reinforced the ideas of the Earth Summit, however, did not go in depth into critical global challenges (Steiner, 2003). Rio +20 was held in Rio de Janeiro in 2012, and like Rio +10, was overall reinforcing the ideas of the Earth Summit where *Agenda 21* was formed, and the challenge that global warming presents (Horn, 2012). There was a greater level of awareness raised about issues with a range of speakers; however, no major developments were made for environmental education (Horn, 2012).

### 2.2.1.2 New Zealand History

From these environmental education conferences, New Zealand has developed its own policy and curriculum initiatives towards what education for the environment should lead to.

In 1988, the New Zealand Government made an official response to the *Brundtland Report* by developing a document for the 43<sup>rd</sup> General Assembly of the United Nations (McChesney, 1991). This responded to the *Brundtland Report* by detailing New Zealand's position with an outline of steps to meet the recommendations put forward, one of which stated that a programme was being prepared for New Zealand's policy response to the *Brundtland Report* which allowed for individual input (McChesney, 1991). Furthermore, with the suggestions put forward in *Agenda 21* in 1992, the Ministry of Education and the Ministry for the Environment responded by beginning to develop statements on EE (Eames & Cowie, 2004). The release of the *New Zealand Curriculum* framework in 1993 saw no formal place for environmental education within the document; however, it acknowledged that schools could help students to become adaptable to a changing environment (Eames & Cowie, 2004).

Stimulated by the Rio Earth Summit, but not by central government, the establishment of Enviroschools in 1993 was a start to seeing schools developing a whole school approach to environmental education (Eames & Cowie, 2004), and it has now spread to 877 schools around the country (Enviroschools, 2013). Enviroschools aims to create a healthy, peaceful, sustainable world through people teaching and learning together by using the whole school approach, and by using five guiding principles (Enviroschools Foundation, 2009). These principles are empowered students, sustainable communities, learning for sustainability, Maori perspectives, and respect for the diversity of people and culture (Enviroschools Foundation, 2009).

Furthermore, in 1999 the Ministry of Education released the *Guidelines for Environmental Education in New Zealand Schools* (Ministry of Education, 1999). These Guidelines cover all learning levels of the curriculum from the first year in primary school through to year 13 in secondary school. The *Guidelines* state that the key factor in achieving an environmental vision of a sustainable future and environmentally responsible behaviour is achieving the vision of *Agenda 21*, as well as New Zealand's own Environment 2010 Strategy, which is through environmental education (Ministry of Education, 1999). The *Guidelines* did not mandate EE as compulsory in schools, however it did define the aims, key concepts, and dimensions of EE as well as offering how EE can be promoted throughout all of the essential learning areas (Law, 2005).

The development of the *Guidelines* and the EnviroSchools Programme has seen EE gaining momentum, and the release of the *New Zealand Curriculum* in 2007 saw more of an emphasis on education for sustainability (EfS), which is a change from the term environmental education. A future focus that encourages students to explore sustainability has been identified in the principles of the curriculum (Ministry of Education, 2007). Ecological sustainability has also been identified as one of the values to be encouraged, and sustainability concepts have been identified in the science, social sciences, as well as technology subject areas (Ministry of Education, 2007).

Since the release of the *New Zealand Curriculum* in 2007, another development has been made for EfS in 2009 with the release of the *Senior Secondary Guidelines for Education for Sustainability* (Ministry of Education, 2009). This web-based document again shifts the focus to education for sustainability (EFS) rather than environmental education. The document states that EfS “is about learning to think and act in ways that safeguard the well-being of people and the planet” (Ministry of Education, 2009, p. 2). These guidelines outline the key concepts, the pedagogy involved in EfS, and connects EfS with current learning objectives in the senior school curriculum (Ministry of Education, 2009). However, for the purpose of this thesis the term of preference is EE and is referred to throughout the thesis. This is because the programme was evaluated against the aims of EE specified in both the *Guidelines* document and the aims from the Tbilisi Declaration.

This history has been of the broad field of environmental education; however, there are a number of issues and concepts that are thought to encompass what environmental education should teach (Hungerford, 2009). Waste education is one of these issues, and the next section focuses on the relevance of waste education in the field of environmental education.

### **2.2.2 Waste Education Development and History**

Discussed in this section is the international and New Zealand history around waste education. To begin, the conception of waste must be defined. The management of waste and consumption is seen as a key theme of sustainable development, as more sustainable ways of addressing the issues around waste are needed (Maddox, Doran, Williams, & Kus, 2011). This need comes from the fact that in New Zealand alone there is an estimated 2.5 million tonnes of waste sent to landfill each year (Ministry for the Environment, 2014). The issue of the growing mountain of discarded resources doesn't just end at the landfill. There are related issues such as methane production in landfills, which is an explosive greenhouse gas, as well as leachate production,

which is a combination of toxic chemicals that accumulates in a landfill and can leak into the environment when the inner lining of a landfill breaks (Waikato Environment Centre, 2014). Therefore, it makes sense that waste and consumption are recognised as an important environmental education issue to be addressed (Taylor, Littledyke, & Eames, 2009). One issue that seems to arise when discussing waste is defining what waste is, as waste to one person may be a valuable resource to another (Williams, 2005). According to the Waste Minimisation Act 2008, waste can quite simply be defined as anything that has been disposed of or discarded (Ministry for the Environment, 2008). Therefore, when discussing waste education there are a range of types of wastes that can fall under this definition. Physical household rubbish, industry waste, as well as materials discarded in the environment through emissions can all be covered under this definition (Taylor et al., 2009).

Waste education has been alluded to as a need to be addressed through environmental education in numerous documents both within New Zealand and internationally. Internationally, the *Tbilisi Declaration* and *Agenda 21* are now discussed, as these have been key documents in the development of environmental education internationally.

The *Tbilisi Declaration* did not specifically mention waste as an environmental issue, rather it defined environmental education. It defined the role of education as an opportunity to address environmental problems, and these problems should be “familiar to learners in their own home, community and nation” (UNESCO, 1978, p. 12). As waste is an environmental issue, and learners all are familiar with waste in their homes, communities and nation, it can be said that waste education could fit into this definition. Furthermore, *Agenda 21* stemming from the Earth Summit in 1992 was a bit more specific regarding issues, but no mention of waste education was made explicit. However, there was an important statement that “schools should involve schoolchildren in local and regional studies on environmental health, including safe drinking water, sanitation and food and ecosystems and in relevant activities” (UNCED, 1992, p. 3). Waste can fit into this statement, as improper waste management can affect drinking water, sanitation, food, and ecosystems.

Within New Zealand, waste education has been addressed through a number of documents. Firstly, the *Guidelines for Environmental Education in New Zealand Schools* specifically states issues that schools can consider for environmental education. Included in these issues are reducing solid waste and litter, as well as waste management at a national level (Ministry of Education, 1999). The idea of waste education is alluded to in the Curriculum as well, as teachers are urged to explore the “long term impact of social, cultural, scientific, technological, economic,

or political practices on society and the environment” (Ministry of Education, 2007, p. 39), which the issue of effective waste management strategies directly relates to.

Furthermore, the Waste Minimisation Act 2008 states that educational activities are effective methods for achieving successful waste management and minimisation outcomes (Ministry for the Environment, 2008). The New Zealand government’s Environment 2010 strategy also discusses waste management as a goal to be achieved through promoting education for the environment (Ministry for the Environment, 1995). This report specifically mentions contamination from landfills, as well as air pollution as environmental threats (Ministry for the Environment, 1995).

### **2.2.3 Summary**

To conclude on the history of environmental education and waste education, it can be said that the history of these topics is relatively young. The *Belgrade Charter*, *Tbilisi Declaration*, *Brundtland Report*, and *Agenda 21* are the specific reports that have had a strong driving force for the development of environmental education worldwide. From these documents, New Zealand has developed its own documents addressing environmental education, perhaps the most definitive of these being the *Guidelines for Environmental Education in New Zealand Schools* (1999). Waste education has stemmed from the broad subject of environmental education and its history has developed alongside environmental education, as it is an issue within this area. Both environmental education and waste education have goals and aims for learners which are discussed in the next section.

## **2.3. Outcomes/Aims of Environmental Education**

In order to evaluate the outcomes of an environmental education programme, it is necessary first to identify appropriate outcomes as according to current literature. For the purpose of this section the aims and outcomes are broken into two sections. The first section covers what current policy and curricula state as the aims of EE, and the second section covers the pedagogical methods and aims in relation to the policy and curriculum level documents.

### **2.3.1. Policy and Curriculum Level Aims and Outcomes**

As mentioned earlier, the *Tbilisi Declaration* stated five categories of environmental education objectives, which describe the ultimate aims of the field. These five categories are now 36 years

old, but they formed the foundation of the 'Aims of Environmental Education' section of the *Guidelines for Environmental Education in New Zealand Schools* document as well (Ministry of Education, 1999). These aims/objectives for students to develop are:

Aim 1: awareness and sensitivity to the environment and related issues;

Aim 2: knowledge and understanding of the environment and the impact of people on it;

Aim 3: attitudes and values that reflect feelings of concern for the environment;

Aim 4: Skills involved in identifying, investigating, and problem solving associated with environmental issues;

Aim 5: a sense of responsibility through participation and action as individuals, or members of groups, whanau, or iwi, in addressing environmental issues. (Ministry of Education, 1999)

In addition, *Agenda 21* states that the Tbilisi recommendations are the guiding principles of its development (UNCED, 1992), and the *See Change* document put out by the Parliamentary Commissioner for the Environment more recently in 2004 states these same aims for EE as well (Parliamentary Commissioner for the Environment, 2004). As the *Guidelines* have not been updated since 1999 and these aims are still referred to, these objectives are still relevant for EE within primary schools in New Zealand.

The *Guidelines* document highlights the complexities of environmental issues related to achieving a sustainable future through education. The document calls for a multidisciplinary, holistic teaching and learning approach to meet these aims (Ministry of Education, 1999). Holistic education is a concept concerned with transforming the foundations of education to focus on a larger vision of education that develops the whole person (Mahmoudi, Jafari, Nasrabadi, & Liaghatdar, 2012). Holistic education goes beyond seeing the environment as a natural system, and it "recognises the totality of the surroundings and links between lifestyles and the use of nature" (Tilbury, 1995, p. 199). One way that holistic teaching aims to do this is through a focus on experience, rather than studying a concept solely from a theoretical point of view (Mahmoudi et al., 2012). Therefore in order to meet the aims of both the *Tbilisi Declaration* and the *Guidelines*, a holistic teaching approach may be applied that focuses on experience that aims to develop the learner as a whole (Mahmoudi et al., 2012).

A very relevant source of policy for current teaching in New Zealand schools is the *New Zealand Curriculum*. As mentioned in Section 2.1.1.2, sustainability holds value in the *The New Zealand Curriculum* document (Ministry of Education, 2007). The principles of the *Curriculum* state that



an aim of schools should be to develop a future focus that encourages students to explore such issues as sustainability. Furthermore, ecological sustainability has been identified as one of the values to be encouraged throughout the entire school as well. In order to achieve these policy and curriculum outcomes and aims of EE, some specific pedagogical aims and outcomes that support these aims have been identified.

### **2.3.2 Pedagogical Outcomes and Aims**

The pedagogical outcomes and aims for delivering environmental education are now discussed.

A prominent trend in the delivery of EE is the three dimension formula: in the environment, about the environment, and for the environment. These dimensions have a place in the *Guidelines for Environmental Education in New Zealand Schools* and are recognised as being the requirement for a balanced EE programme (Ministry of Education, 1999). These dimensions first appeared as a definition of outdoor education (Donaldson & Donaldson, 1958), however, were elaborated on in the context of EE by Arthur Lucas in 1979 (Lucas, 1979). When these three dimensions are used together, the learning taking place is a holistic human response “engaging “hearts” “heads” and “hands” simultaneously in the promotion of environmental sustainability” (Barker & Rogers, 2004, p. 18). Each dimension of this formula has its own techniques and goals.

#### **2.2.2.1 Education in the Environment**

Education in the environment is a teaching technique (Barker & Rogers, 2004). To educate in the environment means to go outside of the classroom to enable a learning atmosphere that creates opportunities for students to engage and develop connections with the environment (Irwin, 2012). To have an effective worthwhile experience in the environment, it is important to harness the learner’s curiosity by encouraging students to question and act as a facilitator in teaching them to learn to learn (Beames, Higgins, & Nicol, 2012). This can be done by using teachable moments, and giving students plenty of opportunity to question. Furthermore, another important concept in learning in the environment is to enable students to take responsibility in their learning (Beames et al., 2012). This is done through giving students opportunities to make decisions, experience consequences of those decisions, and reflect on those consequences (Beames et al., 2012).

This kind of learning atmosphere can be achieved through experiential education. Thomas (2005) states that experiential education “provides an ideal platform to develop critical thinking, self-motivated, problem-solving individuals who participate actively in their communities” (Thomas,

2005, p. 111). Barker and Rogers (2004) also state that experiential learning is the most commonly proposed theory in EE, and helps develop action within students. Experiential learning is “an active process involving the learner being placed in unfamiliar environments, outside their positions of comfort and into a state of dissonance” (Martin, Franc, & Zoukova, 2004, p. 32). Students are able to question and be engaged in a different setting that will harness their curiosity in an experiential setting. Experiential education is then considered a holistic approach, as students are incorporating many educational aspects in this learning strategy including social and environmental education by looking into human impacts on the environment (Quay, 2005).

The idea of learning in the environment relates to all five “Aims of environmental education” as specified by the *Guidelines*. These concepts can contribute to the development of the learner in a holistic sense, as giving a student the opportunity to experience the environment first hand enables the student to examine their complex relationship with the environment.

#### 2.3.2.2 Education about the Environment

Education about the environment is another dimension of the formula to create a balanced EE programme. Education about the environment is based around learning about environmental issues and producing a knowledgeable individual (Barker & Rogers, 2004). However, teaching students about environmental issues is not at all a straightforward task. Based on constructivist theory we know that learners construct their knowledge from their own experience (Jenkins, 2009). Therefore, in order to construct a modified view of the world based on an environmental issue, the student must be offered a collaborative, participatory approach with their peers and teacher in order to offer them new and different learning experiences that challenge their pre-existing ideas (Jenkins, 2009). In the constructivist approach, the teacher is more of a facilitator who helps students construct their worldview, rather than imposing their beliefs on students. The challenge however, is that many environmental issues have a level of controversy with conflicting values (Cotton, 2006). The teacher is encouraged to teach children about these issues, but they are often complex and emotive issues that students all have varied opinions on (Cotton, 2006).

To help students construct a more sustainable worldview through teaching about the environment, the educator can challenge the conceptions that students have around environmental issues through the constructivist method. There are specific pedagogical

strategies that teachers can employ to probe what conceptions students already have around an issue, and to further develop these conceptions into ideas for sustainability (Cotton, 2006).

It is important when teaching about the environment to first understand student's conceptions by exploring students' understanding of an issue (Harrison & Purnell, 2012). Once students' conceptions are out in the open, they need to be given opportunity to discuss their views (Cotton, 2006). This discussion may play out like a debate between students, however the teacher needs to recognise the importance of an unbiased debate and not offer much input of their own personal views (Cotton, 2006). By giving students opportunity to discuss their views on an issue, it further reinforces students' conceptions, and gives students the opportunity to realise their position and reflect on their understanding of the issue. The teacher then needs to challenge the views of the students by using questions or statements, or expressing a different view (Cotton, 2006).

By using these strategies the teacher is identifying and reinforcing the students' own conceptions, and offering other points of view of the issue (Harrison & Purnell, 2012). It is important here for the students to not see an issue as right or wrong, but to see the many complexities around an issue such as the context and ethics around an issue (Harrison & Purnell, 2012). The overall aim then for teaching about the environment can be summed up as teaching all sides of an issue to create informed citizens. When students start to understand different viewpoints of environmental issues, they may begin to feel a sense of values or responsibility about an issue. This is where education for the environment begins to evoke action taking in students.

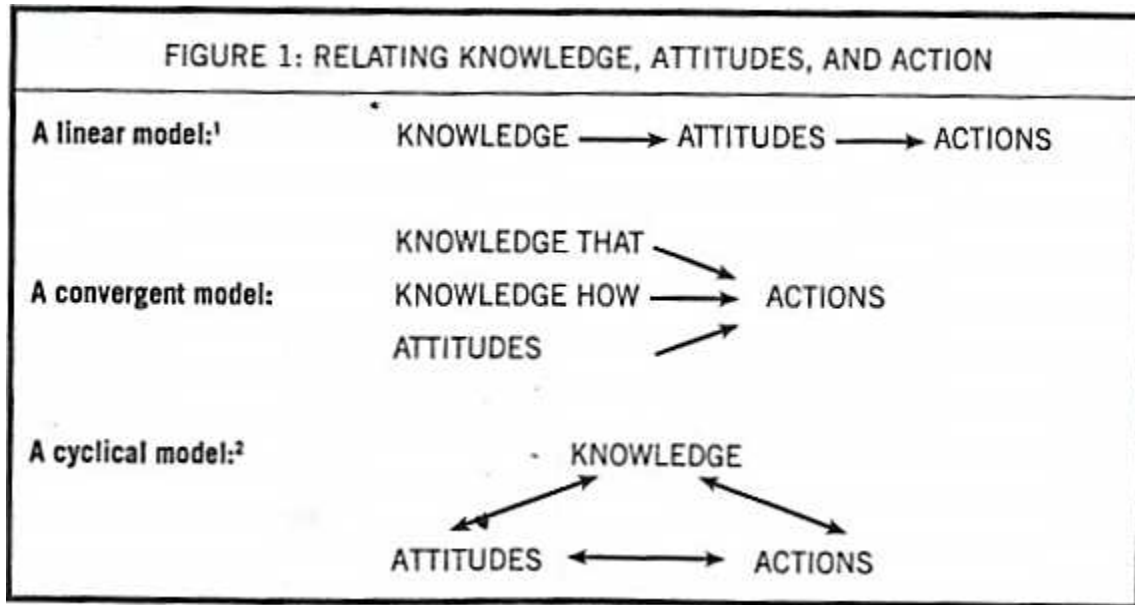
#### 2.3.2.3 Education for the Environment

The *Guidelines for Environmental Education in New Zealand* state that education for the environment is "based on students' knowledge and understanding *about* the environment and their practical experiences *in* the environment" and that "education *for* the environment seeks ways in which people can minimise their impact on the environment" (Ministry of Education, 1999, p. 14). Therefore, to have a balanced EE programme, it is not possible to teach the *for* the environment aspect without having taught the *about* or *in* the environment aspects, as these are all interdependent. By seeking ways to minimise how we impact on the environment, students are doing deliberate planning and action taking to tackle environmental issues. It then is logical that students should have experienced the issue (in) and have learned a bit about the different

sides of the issue (about) before taking action for the environment. The literature has stated a number of ways in which education *for* the environment can be applied.

One of the ways that education for the environment can be applied is again through experiential education. In an experiential learning setting, students will be going into the environment and learning about the environment, but the education for the environment comes in to the process when the students use the knowledge and feelings they have gained, to understand the strong interdependence between people and the environment (Quay, 2005).

Another way that education for the environment can be applied is described by Barker and Rogers (2004). In this, three aspects are described to take into account when describing what can legitimately be claimed as education *for* the environment. The first of these aspects come from Lucas (1979), where he demonstrates a variety of ways that teachers can relate knowledge, attitudes, and actions when approaching education for the environment (See Figure 2.1) (Barker & Rogers, 2004). The linear model in Figure 2.1 demonstrates the idea where if a student gains the knowledge of an environmental issue, they therefore develop the social attitudes which will directly affect the behaviour or action (Lucas, 1979). In this linear model, the only concern for environmental educators would therefore be to produce knowledgeable students, and the attitudes would stem from that naturally which in turn would produce action (Lucas, 1979). However, the convergent model is shown to relate the knowledge that (environmental problem knowledge) with the knowledge how (awareness to solve the issue) and the attitudes towards the solution which would in turn develop the action in the student (Lucas, 1979). In this convergent model, the level of educational intervention is obviously much higher than that in the linear model. Finally, the cyclical model shows the knowledge and attitudes gained would in turn create new action, which would create new goals, and continue working this way in a cycle (Lucas, 1979). There is therefore intervention in all of the aspects in this cyclical model as the facilitator is always working with students to deepen the levels of knowledge attitudes and action.



*Figure 2.1: Relating Knowledge, Attitudes, and Action (Barker & Rogers, 2004)*

Another pedagogical approach that Barker and Rogers (2004) describe as legitimate education *for* the environment is the two criteria described by Jensen and Schnack (1997) in developing action competence (Barker & Rogers, 2004; Jensen & Schnack, 1997). The action competence approach is the scaffolding of the students' ability to take action on an environmental concern through EE (Jensen & Schnack, 1997). Action is the most important part of the concept of action competence, and is described as not being just behaviour change, but having intentional intrinsic motives towards solving an issue (Mogensen & Schnack, 2010). However, it is common for an activity to be assumed to develop action competence, but in reality it is just an activity for students to do. For example, in a situation where a class is learning about how trees can contribute to reducing carbon levels in the atmosphere, a teacher decides that the class will plant a tree for their 'action'. However, according to Jensen and Schnack (1997) this 'action' is not really developing the student's action competence. In order for this task to be most effectively developing student's action competence, it must fit two criteria as described by Jensen and Schnack (1997). The criteria state that the students must be involved in the decision making progress about the action, and the activity must be targeted at solving the problem (see Figure 2.2) (Jensen & Schnack, 1997). Therefore, in the example above, the teacher can develop the students' action competence by asking them what sort of action to take. The term 'competence' then, refers to the idea that action is not just behaviour or habit, rather it is referring to the idea that in teaching action competence there is a need for "relevant knowledge, will, skills and not least critical reflection" (Mogensen & Schnack, 2010, p. 63).

	Students pushed to do something	Students involved in deciding what to do
Activity solely as a counterweight to academic tuition		
Activity targeted at solving the problem		<b>ACTION</b>

Figure 2.2: Criteria for an 'Action' (Jensen & Schnack, 1997)

Furthermore, action competence cannot be converted into a set of observable phenomena (Almers, 2013). Almerts (2013) describes the *aspects* of action competence in more detail than Figure 2.2:

There are *aspects* of action competence that have been described and analysed, such as commitment; willingness and courage to act; knowledge about *consequences* of and *root causes* to problems; knowledge about and capability to develop *visions* and possible *solutions* to a problem; knowledge about how to influence and change conditions; and, finally, to be able to put this knowledge into practice. (Almers, 2013, p. 117)

#### 2.3.2.4 Whole School Approach

As well as the 'in, about and for' formula, another concept called the 'whole school approach' has been presented as a process that can contribute to quality EE. Tilbury and Wortman (2005) describe a whole school approach as a focus towards reorienting a school's structure that integrates sustainability principles across all aspects of the school life (Tilbury & Wortman, 2005). Moreover, Bolstad (2003) quotes the EnviroSchools handbook of 2001 as stating "children learn informally through messages and meanings hidden within the physical surroundings, operational practices and organisational principles of a school" (Bolstad, 2003, p. 61). Whole school approaches often have a strong focus on participation and action, ranging across all the school levels, and education *for* the environment is the pedagogy underpinning this approach (Tilbury & Wortman, 2005). There are some key factors that lead to a successful whole school

programme(Tilbury & Wortman, 2005). First, whole school programmes have found success by working alongside national government policies or priorities, which can build political support as well as longevity. Secondly, the success of a whole school programme depends on support, be it from staff, funding and resources. Thirdly, a multi-stakeholder partnership can help a whole school approach, as having partnerships with governments and the community can bring more expertise and funding into a whole school programme. Overall, whole school approaches are said to “trigger deep levels of change in students, teachers and school administrators”, and are therefore an important concept to include as a pedagogical aim for environmental education (Tilbury & Wortman, 2005, p. 22).

#### 2.3.2.5 Intergenerational Transfer

Another concept explored in the literature that contributes to a successful EE programme, and by inclusion to waste education programmes, is intergenerational transfer (Grodzińska-Jurczak, Bartosiewicz, Twardowska, & Ballantyne, 2003). Intergenerational transfer is a process “whereby school students act as catalysts of environmental change among their parents and other community members” (Ballantyne, Connell, & Fien, 1998, p. 286). This aim is “seen not as an attempt at environmental propaganda, but rather as a means of assisting students to develop environmental citizenship competencies which include informing and influencing the actions of others” (Ballantyne, Fien, & Packer, 2001, p. 1).

Research carried out by Ballantyne, Fien, & Packer (2001) was interested in determining factors that enable this intergenerational transfer to occur. This research was carried out with six EE programmes in both primary and secondary schools, the range of ages were from 9 to 17 year olds. It was found that approximately half of students in a programme did take the influential messages home regardless of messages in the programme; however, there are ways in which to facilitate this transfer. The study found that the factors that influence the frequency of home discussion are not always identical to those that influence the nature of the discussion. Programmes that have novel, fun activities are discussed more frequently, but the nature of discussion with parents at home is more along the lines of enjoyment levels rather than discussing the issues and actions that can be taken. The study further found that one way to get the message home is by involving parents in homework tasks, assignments requiring research, and in class presentations (Ballantyne et al., 2001). Another way to assist intergenerational transfer to occur is to engage the students emotionally by showing students the evidence and effects of an environmental problem, and efforts involved to alleviate the issue. It is important to note that the environmental orientation of parents is not a contributing factor of

intergenerational transfer, but the students' perceptions of parents' levels of interest may influence the frequency of discussion at home (Ballantyne et al., 2001).

### **2.3.3 Summary**

To summarise the aims and outcomes of environmental education, it is convenient to break them down into policy/curriculum level and pedagogical level aims.

For the policy level, the *Tbilisi Declaration* stated the five categories of EE objectives, which have been duplicated in the *Guidelines for Environmental Education in New Zealand Schools*, which is the most up to date guide for teaching EE in primary schools. As well as these five objectives, the *Guidelines* have highlighted the complexities of teaching environmental issues, therefore calling for a holistic teaching approach.

The pedagogical approaches advocated in the literature indicate how to best achieve the policy level aims. The first pedagogical approach is the in, for, and about formula, referring to educating learners in the environment, for the environment, and about the environment. Learning in the environment is the act of teaching outside of the classroom to build personal connections with the environment. Learning about the environment is the process of teaching students about environmental issues, and also understanding the views of the student and their conceptions about the issues. Education for the environment then is teaching students to minimise their impact on the environment. This can be achieved a number of ways as discussed, however, none of the methods mentioned should be used individually as they are all very important in enabling the learner to take action for the environment. The whole school approach is another pedagogical approach in which the entire school contributes to focusing on participation and action for the environment, enabling the learner to be exposed to these concepts through the principles and everyday life of the school. Finally, intergenerational transfer is an important aim for an EE programme as the transfer of knowledge is developing the student's action taking skills as well as educating the community about environmental issues.

The overall aims and outcomes of EE have been identified, therefore it is necessary to explore and identify the principles and frameworks for evaluating EE programmes.

## **2.4 Evaluation**

### **2.4.1 Evaluation in Education**

Evaluation can be defined as assessing the value of something (Robson, 2000). More specifically, evaluation is an applied science with methodological steps, and is much more complicated than



just directly applying knowledge from books (Denzin & Lincoln, 2008). The evaluator must be concerned with a number of aspects before beginning the evaluative process. To begin to understand the role of evaluation in education it is first important to understand the features of educational evaluation that make it different from evaluation outside of the education field. As well as this understanding, it is important to understand the role that the evaluator must take when undertaking evaluative research.

Kelleghan and Stufflebeam (2003) describe three distinct features of educational evaluation that make it different from other types of evaluation. In education, evaluation is rooted in student achievement/assessment, programme evaluation, and curriculum evaluation, while other professions use evaluation as a form of “applied research” (p. 3). Secondly, as education is considered one of the predominant social services of society, the outcome of an evaluation can affect many members of society, therefore concerns of the audience and stakeholders in an educational evaluation are of importance. Thirdly, teachers play a large role in evaluation, either as the evaluators or stakeholders of the evaluation, and must be taken into account during the evaluation as they know their learners very well.

Furthermore, the evaluator must take on a role when doing an evaluation on an educational programme. The evaluator must engage with the people involved in the evaluation, and attempt to create a safe space for all involved (Denzin & Lincoln, 2008). To create this safe space, the evaluator is not detached from the programme; rather the evaluator has a respectful relation with the programme, and helps those involved by engaging in practice rather than being an outsider (Denzin & Lincoln, 2008). The role that was taken for the purpose of the evaluation was be guided by these ideas, as in order to fully understand the context of the evaluation, all people involved needed to feel comfortable talking to the evaluator.

It is also very important to consider the purpose of evaluation in education, and the intended outcomes for an evaluation. Evaluation is usually used to “inform policy and guide decisions such as determining effectiveness, identifying areas for improvement, optimising resource allocation, or empowering individuals (teachers, students, administrators, policy makers, etc.) in their respective roles” (Cook, 2010, p. 297).

Moreover, the purpose of evaluation must also be to support the programme/organisation in achieving its goals (Calder, 1994). More specifically, in a review of the literature it was found that utilization-focused programme evaluation is the most common approach in EE evaluation (Carleton-Hug & Hug, 2010). Utilization-focused evaluation is essentially user focused, as it is

intended to be utilized by the programme to detect and correct error in and help the organisation to move forward and implement modifications (Calder, 1994; Kellaghan & Stufflebeam, 2003). Therefore, the intended outcomes of the evaluation would be to determine if the programme is achieving its intended goals and determine the effectiveness of the programme, while supporting the programme and helping it improve.

Understanding of the general definition, purpose, and intentions of evaluation are important to distinguish, as are the approaches and methods of educational evaluation. Firstly, evaluations can be broken down into two main types; formative and summative evaluations. It is useful to make the distinction as the two types make a difference when designing an evaluation (Robson, 2000). Formative evaluation is concerned mainly with the development or forming of the programme (Robson, 2000). In formative evaluations, the evaluation serves the purpose of shaping the programme towards an intended goal, or improving areas (Calder, 1994). On the other hand, summative evaluation is focussed on forming a judgement based on what the programme has achieved (Robson, 2000). In summative evaluation, the focus is on intended goals of a programme and whether or not it achieves these goals (Robson, 2000). Moreover, it is important to note that not all evaluations are strictly summative or formative, as most programmes wish for information on how to improve as well as to explore what the outcomes are for the particular programme (Robson, 2000).

## **2.4.2 Evaluation in Environmental Education**

### **2.4.2.1 Evaluations in the Literature**

There have been a number of evaluations done specifically within the field of environmental education (see Zint, 2013b) however, as previously discussed, there are a wide range of topics within EE. The same idea can be applied to EE programmes; there are a large number of these programmes, each with their own goals and intentions (Monroe, 2010). For the purpose of this section, a range of evaluations carried out with an environmental and waste education focus are examined. The purpose in reporting these evaluations is to define what these evaluations were looking for, what their frameworks were, how the evaluations were carried out, and the outcomes of each evaluation.

The first of these evaluations on waste education programmes that was explored was carried out in Poland in 2003. The evaluation sought to evaluate the impact of a waste education programme upon students' (aged 11-13), parents', and teachers' environmental knowledge and behaviour (Grodzińska-Jurczak et al., 2003). Grodzińska-Jurczak.al. state that the research was

trying to determine the prior knowledge of the students as well as the other target audiences' attitudes and behaviours (Grodzińska-Jurczak et al., 2003). The purpose of the programme was identified as assisting classroom teachers to teach this programme in a way that helped solve municipal solid waste (MSW) problems. After the researchers identified what the programme's outcomes and purposes were, a survey was designed based on students' ideas of MSW and knowledge around MSW to administer to students before and after the programme (Grodzińska-Jurczak et al., 2003). As well as this survey, a questionnaire was designed for parents, based on changed practices after the students went through the programme, and whether or not parents were made aware of the programme. Another survey was for teachers based on the acceptance of the programme by students and suggestions for improvement of the programme (Grodzińska-Jurczak et al., 2003). This evaluation clearly set out the goals of the programme and a way that the evaluators could assess these outcomes. The final outcome of this evaluation was that the programme had a positive impact on knowledge of the students and parents; however, there was no evidence that families demonstrated a change in household waste behaviour (Grodzińska-Jurczak et al., 2003).

A second evaluation on waste education was carried out in Mexico in 2009, and was based around evaluating the impact of an extracurricular EE programme on students' ecological knowledge. This programme was based on a range of environmental issues which included waste management, and was started as a need was recognised for EE (Ruiz-Mallen, Barraza, Bodenhorn, & Reyes-García, 2009). This study states the importance of using both qualitative and quantitative methodologies when evaluating EE to increase the validity of the results (Ruiz-Mallen et al., 2009). The researchers in this study used qualitative methods via 11 in-depth interviews to assess the knowledge of the learners, and two focus groups to provide "a descriptive context for the study results" (Ruiz-Mallen et al., 2009, p. 375). The quantitative method used was a written questionnaire to assess the students' knowledge (Ruiz-Mallen et al., 2009). Overall, this evaluation, much like the evaluation by Grodzińska-Jurczak et al. was focussed on the intention of the programme and the methods of measuring the learning happening through the programme against the intended learning. The results of this study found that the ecological knowledge of the students was raised through exposure to the programme (Ruiz-Mallen et al., 2009). The study also found that the ecological knowledge and awareness of their environment was also positively affected when students participated in the planning of the programme.

Another evaluation was based in Catalonia, Spain in the year 2000. This evaluation was intended to evaluate the Global Environmental Education Programme of Cornellà which aimed to increase students' knowledge of environmental issues, including waste and water saving (Rovira, 2000). The aim of the evaluation was to find out if the programme influenced the students' waste management and water saving habits, and the habits of their families (Rovira, 2000). However, it was stated that the "objectives, techniques and underlying hypotheses" of the programme were not defined in an operational way, therefore the evaluation was unable to compare the effect of the programme before and after the students went through it (Rovira, 2000, p. 144). The researchers used quantitative and qualitative techniques to evaluate the outcomes once the programme had concluded. The method of evaluation then was to gather a range of schools that had and had not completed the programme and hold seven focus groups and distribute 200 questionnaires. The aim of the focus group was to "find out the participants' experience of environmental education", and the survey was to find out about the opinions and habits of the students and parents (Rovira, 2000, p. 148).

The goals and aims of the programme had not been identified in an operational way; however, the evaluation still set the intention of the programme against what the programme was actually doing as the framework of the evaluation. This evaluation also used quantitative and qualitative methodologies together. The conclusions of this evaluation were that intergenerational transfer was not apparent with this programme, and the evaluation noted the limitations of qualitative data in that it can only portray a 'general frame' of what is actually happening (Rovira, 2000).

A fourth programme evaluation was based in California in 2007. This evaluation was evaluating the Four R's Action Programme to determine the impact and effectiveness of this waste reduction programme on students, teachers, and families (KidsfortheBay, 2007). This evaluation established the goals of the Four R's Action Programme, and set out their evaluation questions. The questions were based on programme effectiveness and how the programme could improve, and the experiences and overall impact on knowledge of the students and teachers (KidsfortheBay, 2007). This evaluation used both qualitative and quantitative evaluation techniques through surveys of the students and teachers before and after the programme, and the evaluation forms that teachers fill out about the programme, and a follow up survey of teachers a year after the programme (KidsfortheBay, 2007). This evaluation report was the most in-depth of the four waste education programme evaluations reviewed here, as it clearly defined evaluation questions and methodologies and had a significant portion of the write-up dedicated to the methods used and the reasoning behind the methods, as well as an in-depth

data analysis. This is useful for the reader in understanding the reasoning behind the methodologies of the evaluation. The conclusions of this study show that the programme had a clear impact on students' content knowledge, vocabulary, concern for the environment, as well as actual action taking (KidsfortheBay, 2007).

Based on the methodologies of these four evaluations a trend can begin to be observed in which the evaluation determines the goals and aims of the programme and applies them against what is observed to be happening. These evaluations are useful when beginning to think about how to carry out an EE programme evaluation. However, there are also challenges and opportunities when evaluating an EE programme.

#### 2.4.2.2 Challenges and Opportunities for Evaluation in Environmental Education

There exist a number of challenges and opportunities for evaluators in the field of EE evaluation. A major challenge when evaluating these programmes is the compressed time frame for the evaluation (Carleton-Hug & Hug, 2010). Most of the evaluations identified in the literature were carried out over a short time frame, which makes the long term impact very hard to measure. Another challenge for evaluation is the fact that there are always other sources of information coming to participants in a programme, such as media influences around environmental issues, making it harder to determine the impact of the EE programme alone (Carleton-Hug & Hug, 2010). There is also concern when an educator comes into a classroom regarding information sources, as the amount of work that the teacher has done with a class before a programme educator comes in can impact the outcome of the programme (Carleton-Hug & Hug, 2010).

The opportunities for EE evaluation come from identification of a range of evaluation techniques that some published evaluations left out. Firstly, there is a need for evaluators to make the findings of the evaluation accessible to practitioners, as they are the end users of the evaluation (Monroe, 2010). Furthermore, another opportunity that evaluators need to take is to make recommendations to the programme based on the findings as well as suggest what evaluators may do differently next time (Monroe, 2010). This type of reflecting will help programme evaluation evolve and model it for future evaluators. Another suggestion is to not just report if the programme is meeting their outcomes, but seek to answer the harder questions of why the programme is successful or not, and what the factors are that can be accounted to the success (Monroe, 2010). Taking into account the challenges and opportunities of educational evaluation informed the next section on choosing a guide to evaluate the programme.

#### 2.4.2.3 Guides for Evaluation in Environmental Education

Through the literature review four guides were located on the process of evaluating an EE programme. The four guides have been published by different bodies at different points in time. Here the guides are described based on their strengths and weaknesses and usefulness for the context of the Zero Waste Education programme evaluation.

The first of these guides was published by UNESCO in 1984 (UNESCO, 1984). This guide breaks evaluation into four steps: deciding what to evaluate, planning the evaluation, conducting the evaluation, and making use of the results (UNESCO, 1984). The strengths of this document are the depths that it goes into when reporting the findings of an evaluation. This guide goes into great detail on analysis of the data for specific scenarios such as student development through a programme, and comparing control groups. This guide also offers a case study of an evaluation which helps to clarify the evaluation methods. However, this guide has its weaknesses as well. Firstly, the section based on planning an evaluation is not as in-depth as the section for instruments and analysis for evaluation. Secondly, the guide was published in 1984, making it just less than 30 years old. Evaluation in environmental education has further developed as a field since this guide was published, which lead the research to identify other guides.

A second guide was published in 1999 by the IUCN Commission on Education and Communication in the UK (Stokking, Aert, Meijberg, & Kaskens, 1999). This guide breaks down the evaluation into thirteen steps, the first eight steps have a focus on planning and design of the evaluation, steps nine and ten are based on data collection and analysis, and the final two steps are focussed on reporting. Immediately this guide appears better to use than the UNESCO guide as the level of detail in every section seems to be much greater. This guide has a larger emphasis on choosing what and how to evaluate and analyse findings in a range of scenarios, and emphasises the level of thought that needs to occur before and after collecting data. This guide appears to offer answers in specific situations where researchers may need guidance in evaluating, regardless of being nearly fifteen years old.

Another guide was published in 2004 by the Department of Environment and Conservation in New South Wales (Department of Environment and Conservation NSW, 2004). This guide, as with the UNESCO guide, offers four steps in carrying out the evaluation. The first step is based around theoretical thinking around evaluation, the second step is design, step three is developing an evaluation framework, and the fourth section is focussed on learning from the evaluation. The level of depth that this guide offers in developing the framework for evaluation

is strong for the purpose of this evaluation. This guide very clearly lays out the entire evaluation process before it is undertaken. The weakness of this evaluation guide, however, is the lack of depth of data analysis and reporting.

Another evaluation guide is MEERA, located online and based in Michigan USA. MEERA is a website with a database of environmental education evaluations and tips on how to evaluate (Zint, 2013a). MEERA offers an eight step process of evaluation, which covers program logic, setting goals, designing the evaluation and data collection and analysis, as well as the reporting of results. The steps based on determining programme logic, and setting goals and indicators appear to be quite in-depth. Program logic is the logic model of inputs turning into outputs that result in outcomes, and MEERA suggests that thinking in this way will help shape the goals of the evaluation (Zint, 2013a). This is a very recent evaluation guide, however, its overall weakness is that it does not go into great detail with each step, rather it just explains the concepts and provides further resources. Being a website with links to many other websites, it is not neatly organised into a guide. MEERA definitely offers great information and places for further reading; however, is not a handy reference guide like the others.

Reading through these different guides, only one guide was chosen to be used. The guide published by the Department of Environment and Conservation NSW was chosen for its depth in the planning of the evaluation framework. The guide follows a sequence of procedures for evaluating an EE programme. The early stages are based around understanding the programme logic to develop a framework for evaluation (Department of Environment and Conservation NSW, 2004).

#### **2.4.4 A Framework for Environmental Education Evaluation**

For this thesis Zero Waste Education was evaluated. To start off, thinking around doing the theoretical framework was created. The theoretical framework evaluated the Zero Waste Education programme based on what current environmental education theory shows effective environmental education to be. Therefore, the template provided by the Department of Environment and Conservation NSW (see Figure 2.3) was used for developing the framework.

	Evaluation Questions	Performance Indicators	Performance Information	Making Judgements About Success (Did We Do Well?)
<i>Ultimate Outcomes</i>	-	-	-	-
<i>Intermediate Outcomes</i>	-	-	-	-
<i>Immediate Outcomes</i>	-	-	-	-
<i>Activities</i>	-	-	-	-
<i>Needs</i>	-	-	-	-

*Figure 2.3: A model for an Evaluation Framework*

However, to ensure validity in this evaluation, it was important to first understand the framework model. To begin, the left axis of the model (*Figure 2.3*) is described. The boxes along the left axis are the outcome hierarchy (Department of Environment and Conservation NSW, 2004). The outcome hierarchy is the proposed model of evaluation planning for the document and it aims to describe a logical chain of causes and effects (Department of Environment and Conservation NSW, 2004). The ultimate outcome refers to the main goals and impact of the programme, whereas the intermediate outcomes would be the change in “individual or group knowledge, skills, attitudes, practices and behaviours” (Department of Environment and Conservation NSW, 2004, p. 13). The immediate outcome describes the “levels and the nature of participation and the reactions to the activities used to engage participants” (Department of Environment and Conservation NSW, 2004, p. 13). The activities box describes the “outputs, products and/or services produced and delivered by the program that allow you to achieve your outcomes” (Department of Environment and Conservation NSW, 2004, p. 13). There will often be more than one activity in this box to bring out the desired outcome (Department of Environment and Conservation NSW, 2004). Lastly, the needs box describes what is trying to be achieved with the programme by bringing the actual state of the issue to the desired state (Department of Environment and Conservation NSW, 2004). For example, with a river study an actual state of a river could be polluted, whereas the desired state would be clean water. The need would therefore be reduced pollution, as the need describes what is trying to be achieved.



The top axis of the model for an evaluation framework (*Figure 2.3*) is the next section of the framework to describe. The evaluation questions box will “reflect the proprieties and purpose of the evaluation” (Department of Environment and Conservation NSW, 2004). At each level of the left axis the evaluation questions serve the purpose of forming the basis of the evaluation and clarify the expectations of the evaluation (Department of Environment and Conservation NSW, 2004). Performance indicators are therefore in the framework to show that the programme is realising its outcomes, and serve the purpose of recording the outcomes (Department of Environment and Conservation NSW, 2004). The performance information boxes are where the thinking of what information (either quantitative or qualitative) is needed to measure the performance indicators for each outcome. Finally, the judgements box is the area for the evaluator to compare the performance of the programme against targets, milestones, standards, or expectations (Department of Environment and Conservation NSW, 2004). It should be noted that some outcomes are unable to be compared against standards.

#### **2.4.4 Summary**

In summary, evaluation is an excellent tool when used properly to understand what is happening in a programme. In educational evaluation, an evaluation can be very meaningful for a programme as it can determine the effectiveness of a programme and identify any areas where a programme may need to improve. A number of EE programme evaluations were identified to determine the common tools and principles of the evaluations to guide this evaluation. Based on these evaluations the common approach was to determine the goals and aims of the programmes they set out to evaluate and design tools around assessing if the programmes involved are doing this. This idea corresponds with the methods that the Department of Environment and Conservation in New South Wales provide in their guide to evaluating environmental education programmes (Department of Environment and Conservation NSW, 2004). Furthermore, this guide’s framework was chosen for the evaluation, alongside with the thirteen steps in-depth evaluation guide published by IUCN Commission on Education and Communication (Stokking et al., 1999). The evaluation questions derived from the populated evaluation framework can be seen in section 3.5.1 of Chapter three, methodologies.

#### **2.5 Chapter Summary**

The development of EE gained momentum in the 1960’s and 1970’s from concerns of worldwide environmental degradation. There were a number of international conferences which sought to

define and develop EE and what it should aim to achieve. In New Zealand the initial result of these conferences was the development of Enviroschools and the *Guidelines for Environmental Education in New Zealand Schools*. The development of these has seen EE gaining more momentum, with the 2007 *New Zealand Curriculum* document including sustainability in the science, social science and technology subject areas.

With the development of EE have come five aims for the field to develop in learners. Awareness and sensitivity to the environment, knowledge of the environment, attitudes and feelings of concern for issues, skills associated with problem solving issues to do with the environment, and participation and action skills to address environmental issues have all been identified as aims of EE. These five aims can be addressed with a number of pedagogical techniques including the 'in, for, and about' method, the action competence approach, the whole school approach, and the encouragement of intergenerational transfer.

As this research project is an evaluation, it is also important to understand evaluation methodologies. Evaluation is a process in which the intended outcomes of the programme are determined and tested to see if the programme is achieving its intended goals and determine the effectiveness of the programme, while supporting the programme and helping it improve. With an understanding of the aims for EE as a subject and the goals of the programme, an evaluation can begin to take shape. A limited number of evaluations of EE programmes were identified in the literature, although a number of guides to assist practitioners to conduct evaluations have been published. From one of these guides an analytical framework was developed for conducting the evaluation in this study and can be seen in Appendix C.

The next chapter describes the methodological approach taken for this evaluation.



## **Chapter 3 Methodology**

### **3.1 Chapter Overview**

This chapter describes in detail the methodological considerations for the research with justification of the methodological approaches used. It begins by describing the research questions, and then discusses the nature of the research and the theoretical considerations for the research instruments. The design of the research project is then described as well as issues around the quality of the research with mention to validity and reliability issues. The chapter finishes with a summary.

### **3.2 Research Questions**

This research was an interpretive case study that sought to evaluate a waste education programme called Zero Waste Education which operates in schools around New Zealand. This study aimed to evaluate Zero Waste Education based on their desired aims of the programme, as well as the desired aims of environmental education based on the current literature. The research questions that instigated the study were:

1. What are the intended goals and outcomes of the Zero Waste Education programme and how is the programme meeting these?
2. What are the intended goals and outcomes of environmental education and how does the Zero Waste Education programme support these?

The research questions were concerned with measuring goals and inputs of the programme against the outcomes, or outputs. It was the intention of the evaluation to provide evidence to the programme of whether or not they are meeting their desired goals and intentions, as well as the desired intentions of a programme of this nature according to current theory in the field. With the outcomes of this evaluation, the programme has the opportunity to utilize the results to further shape and develop the programme into a stronger and more effective programme if necessary. However, to effectively attempt to answer these research questions, there must be an appropriate grounding in the methodological theory of this type of research.

### **3.3 Nature of Research**

The nature of research is deeply rooted in philosophy of knowledge, how it is acquired, and how it is communicated to others (Cohen, Manion, & Morrison, 2011). The field of research methodology is very complex, however, Punch (2009) recognises the complexities of the field

and states that in a very simplified form there are two paradigm positions; positivism and interpretivism (Punch, 2009).

The positivism paradigm is generally associated with quantitative research methods (Punch, 2009). Positivism can be defined as the belief that “objective accounts of the world can be given, and that the function of science is to develop explanations in the form of universal laws” (Punch, 2009, p. 18). This paradigm is based in the assumption that everything can be measured and quantified, however this is not always the case when discussing the complexities of human behaviour (Cohen et al., 2011). This paradigm defines life in measurable terms, rather than taking into account individuality and experience of the individual (Cohen et al., 2011). Positivism is not often applied in social sciences as it is not able to answer many of the interesting and important areas in life (Cohen et al., 2011).

For the purpose of this study it was not felt that the positivist paradigm was applicable, as the study was interested in how the learners going through the programme make meaning of the messages being delivered, and therefore indicated use of qualitative research design. Qualitative research design is applied within the interpretivist paradigm. Interpretivism “concentrates on the meanings people bring to situations and behaviour, and which they use to understand their world” (Punch, 2009, p. 18). This paradigm is much more common in social sciences, in which the complexities of human behaviour and experience are being observed (Cohen et al., 2011). Interpretivism recognises that humans actively construct their world based on events and contexts and situations, and therefore behave according to them (Cohen et al., 2011). Furthermore, interpretivism looks for the processes through which behaviour occurs rather than simply looking at knowledge and behaviour as outcomes or products (McMillan, 2012). The interpretive researcher develops theories and assumptions based on the data to understand behaviour of the participants. The interpretivist paradigm therefore was appropriate for this research as it was seeking to understand the influences on the learners and how they made meaning of the programme as they were experiencing it.

A common qualitative research tool, which was employed in this study, is the case study. Yin (2009) states that case studies have a distinct place in evaluation research. Many of the methodologies used in case studies are consistent with qualitative research traditions, as doing a case study can offer the researcher a holistic understanding of a programme (Gall, Gall, & Borg, 2007; McMillan, 2012). A case study can be defined as a formal research method that provides an instance in action (Cohen et al., 2011). The case study takes a snapshot of an instance, and can illustrate how action and theories fit together to form an understanding that can be applied

to similar situations (Cohen et al., 2011). This is beneficial for the research as the rich description of events and their analysis can offer Zero Waste Education an in-depth analysis of their programme in a single instance which can be projected to the rest of the programme.

Yin (2009) describes three types of case studies in terms of their outcomes. These are exploratory, descriptive, and explanatory. The goal of the exploratory case study then is to develop hypotheses for further study (Yin, 2009). The exploratory case study is a pilot to other studies or research questions (Cohen et al., 2011). In an exploratory case study, the fieldwork and collection of data is often done before any official definition of a research question, as it is for determining the feasibility of the research (Hancock & Algozzine, 2011). The explanatory case study exists for testing theories, and generating hypotheses that are used in larger scale research (Cohen et al., 2011). Moreover, in explanatory case studies the primary purpose is to determine “how events occur and which ones may influence particular outcomes” (Hancock & Algozzine, 2011). The descriptive case study is used to provide narrative accounts (Cohen et al., 2011). In descriptive case study design, the goal is to “present a complete description of a phenomenon within its context” (Hancock & Algozzine, 2011, p. 37).

The type of case study that was chosen for the evaluation was the descriptive case study, as the study was interested in describing in detail the context of one school and the involvement of the ZWE programme in that school. Once the paradigm and methodologies were chosen it was then important to determine which research instruments and data collection methods were appropriate to use for the case study.

### **3.4 Research Instruments**

Choosing which instruments to use is crucial for the researcher to get the most from the study. There is no definitive method or instrument for conducting social research, as the use of instruments is highly contextual. Every instrument has its own strengths and weaknesses, and different research instruments are used for different purposes (Wilkinson & Birmingham, 2003). The research instruments chosen for the case study in this thesis were interviews, questionnaires, observations, focus groups and document analysis. Some theoretical notions of each type of research instrument the study used as well as practical ways to use them are now discussed.

#### **3.4.1 Interviews**

In the research, interviews were used a number of times. The interview as a data collection technique is the most prominent tool used in qualitative research (Punch, 2009). The interview,

according to Cohen et al. (2011, p. 349), is an “interchange of views between two or more people on a topic of mutual interest, sees the centrality of human interaction for knowledge production and emphasises the social situatedness of research data”. Knowledge is constructed in this interaction between the interviewer and interviewee, and this interaction is recognised as a great source of qualitative data as it takes into account the interviewee’s interpretations of the world (Cohen et al., 2011). However, the interview is not subjective or objective, rather the interview is intersubjective (Cohen et al., 2011). This is because the interview is not just collecting quantifiable data, but recognising the data is based in human experience and the complexities of life.

The interview is not simply an exchange of information in a casual conversation, as the interview is well thought out and has a purpose. However, there are a range of different types of interviews according to the literature. Cohen et al., 2011 recognises this and state that from these different interpretations, four types of interviews can be drawn; the structured interview, the unstructured interview, the non-directive interview, and the focused interview. The structured interview is one where the interviewer is in control of the order of questions, and there is an element of predictability in the interview which can help provide an easier framework for analysis (Wilkinson & Birmingham, 2003). The unstructured interview is still a carefully planned interview and the discussion is led by the interviewer; however, the questions are not predetermined (Cohen et al., 2011). Rather, the interviewer goes in with purposes for the interview and will guide the interview as appropriate. The downside with this type of interview is that the analysis of the data can be much more complex (Wilkinson & Birmingham, 2003).

The third type of interview as identified is the non-directive interview. In this type of interview, the respondent is encouraged to express his/ her feelings as he/she wishes, and the role of the interviewer is to probe for clarity based on a pre-figured framework (Cohen et al., 2011). From this type of interview came the focused interview, which sought to put more interviewer control in the non-directive interview (Cohen et al., 2011). In this type of interview, the researcher is probing the respondent on a known situation based on a formulated hypothesis of the interviewer, making the data more manageable (Cohen et al., 2011).

As well as interviews as a data collection tool, questionnaires were also used.

### **3.4.2 Questionnaires**

The questionnaire is a very useful instrument in data collection. The questionnaire can provide data which is quantifiable and structured in a way that can be straightforward to analyse (Cohen et al., 2011). There are many types of questionnaires for different purposes, from highly structured interviews to unstructured (Cohen et al., 2011). Just as there are many different types of questionnaires there are also many types of questions. For the data collection, the questions were ranging between open and closed as well as rating scales and multiple choice questions. However, there are issues to avoid in designing questions (Cohen et al., 2011) such as: leading questions that suggest just one acceptable answer, complex questions, irritating questions, too many open ended questions, pressuring, extremes in the rating scales, and ambiguous questions. Avoiding these features will contribute to a more reliable questionnaire.

In constructing the questionnaire, McMillan (2012) has identified a range of steps to take into account. Firstly, there must be a sound justification for the research through a review of the literature in which a framework and theoretical foundation is laid. Next, the objectives of the questionnaire need to be made clear, linking the research questions with the questions on the questionnaire. The questionnaire is then designed and trialled to obtain feedback on the tool, and then any revisions that are needed are made. Special care needs to be taken when sequencing the questions to ensure that they are sequenced in a logical order. The researcher needs to be aware that the early questions will set the tone of the rest of the questionnaire so the questions need to be non-threatening and phrased in a way that will keep the respondent wanting to answer them (Cohen et al., 2011). Furthermore, the closed questions should come before the more open ended questions as the respondent builds confidence and motivation throughout the questionnaire making them more likely to complete them (Cohen et al., 2011).

Observations were also used in the data collection stage of this study.

### **3.4.3 Observations**

Observations offer the researcher opportunity to gather 'live' data, in which the behaviour and learning happening can be observed directly (Cohen et al., 2011). The benefit of using observation then is that the researcher can see how people behave in situations rather than relying on their accounts through other data collection methods (Burton & Bartlett, 2009). Another benefit to observation is that it can bring certain practices or behaviours to light that the researcher was previously unaware of (Burton & Bartlett, 2009). Observations also give the researcher a picture of contextual factors that can influence the interpretation of the results,



including results from other instruments in the study (Cohen et al., 2011). A weakness of observation, however, is that the observation itself can skew the situation, as the people being observed may act differently (Burton & Bartlett, 2009).

There are a number of types of observation that can occur. Firstly, there are indirect observations in which there is a recording device in place of the researcher, and direct observations where the researcher is present (Cohen et al., 2011). Secondly, in the observation the presence of the researcher is known or unknown. The presence of the researcher can be unknown through hiding behind a one way mirror, or the researcher is seen but not identified as a researcher (Cohen et al., 2011).

Finally, the role taken by the observer can be either a participant or non-participant observer. The participant observer is one whom immerses himself or herself in the group being observed, and becoming involved in the activities of those being observed (Dahlberg & McCaig, 2010).

As well as observations, the use of focus groups also informed the study's outcome.

#### **3.4.4 Focus Groups**

Focus groups are another form of interview, however, they are not simply conversation backwards and forwards between the interviewer and the participants (Cohen et al., 2011). In a focus group, the researcher gives the participants starting topics, and the goal is for the researcher to gain a collective view of the group to further his or her understanding of the situation (Cohen et al., 2011). In this type of interaction the participants are interacting with each other, thus allowing their views to emerge without the researcher's agenda dominating the situation (Cohen et al., 2011). While focus groups are quite an unnatural setting for flow of conversation, they are very focused on a specific topic, allowing for rich data to emerge for the researcher. The focus group brings this data out in ways that a one on one interview or questionnaires may not bring to the surface (Cohen et al., 2011).

With the practicality of focus groups in mind, developing questions needs to be given careful consideration. The questions need to be constructed in a way that is non-threatening to the participants, as well as embedded neatly for flow of conversation (Wilkinson & Birmingham, 2003). There is not a need for too many questions, and the amount will be far fewer than one would use in an interview (Wilkinson & Birmingham, 2003). Furthermore, questions must be open ended, and ordered in a way that allows for maximum flow of conversation (Wilkinson & Birmingham, 2003).

Finally, the use of document analysis was also a key data collection tool that was employed in this study.

### **3.4.5 Document Analysis**

Documents are any form of written records. For the purpose of this study, the documents analysed were the lesson plans that the Zero Waste Education programme supplied for the educator as well as the documents that ZWE supply the teachers regarding planning for their classroom. The most common use of document analysis is to support the data collected in other methods (McMillan, 2012). Therefore, the analysis of the documents in the study was used to further triangulate theoretical ideas that were being explored through the evaluation.

### **3.4.6 Summary**

To summarise, there are a number of tools and techniques available to researchers for collection of their data. Each of these tools has specific instances in which they need to be employed, and their use is at the discretion of the researcher. For this evaluation, interviews, questionnaires, observations, focus groups, and document analysis were used. Each of these has theoretical ideas underpinning their use, as well as numerous uses of each tool suited to the researchers needs. In the next section, how each tool was used in the evaluation of the Zero Waste Education programme is described.

## **3.5 Research Design**

This study was in the interpretivist paradigm, as the evaluation was interested in the processes through which knowledge was acquired and behaviour occurred while students went through the programme. Therefore, a combination of both qualitative and quantitative methods was used to best understand this. Interviews with staff of the school and the ZWE educator were used, and the interviews were transcribed and analysed for themes. Student questionnaires and parent questionnaires were also used which were coded for analysis. The design of the evaluation is now described in greater detail.

### **3.5.1 Research Approach**

This study was undertaken with a personal aim of examining the practice of EE in schools. Consequently, Zero Waste Education were contacted regarding any research that the company may have in mind involving their programme, and this evaluation is the result of that initial contact.

As the thinking about the approach that would be taken in this study began, it became obvious that the study needed to benefit Zero Waste Education. Therefore, a utilization focussed evaluation was chosen via a descriptive case study. Using the utilization focussed evaluation approach would help Zero Waste Education to get useful results from this evaluation and the descriptive case study was the best method due to the limited scope of the research.

As this was a utilization focussed evaluation case study, it was firstly very important to determine the evaluation questions that would underpin the evaluation. ZWE was contacted and asked to supply their desired aims and outcomes (see Appendix A), as these aims are the basis of evaluation. The literature was investigated to determine the main theoretical aims of EE (see Appendix B). From these two sets of aims the theoretical framework that informed the creation of the evaluation questions was created (see Appendix C).

The evaluation questions were:

- Does the ZWE programme enable students with the action taking skills needed to deal with their waste in a sustainable way?
- Are the messages of the ZWE programme being taken home to parents? If so, is there any change in household waste practices?
- Is the delivery of the ZWE programme relevant to current waste education theory?
- Do students have further awareness of waste and resource management after going through the ZWE programme?
- Does the programme work alongside the school to create a whole school environment supportive of environmental education?
- Is the programme supported by the school and teacher?
- Are the lessons congruent with the *New Zealand Curriculum*?

To put these evaluation questions to use, a school needed to be identified. Due to the scope of the research, the case study needed to take place in just one primary school that was running the programme. To carry out this case study, a school was needed that was willing to participate. Schools were contacted that were going to run the Zero Waste programme in the data collection period. ZWE initially provided me with a couple of options of schools to contact, however after contacting them it was found that the schools were very busy and hesitant to have an evaluator come in for data collection which led to a few rejections before finding a school that wanted to be involved.

Once contact was made with a school that was interested in participating, the principal was asked to consider participating, and if agreed, was then asked to sign a consent form. The next step was contacting the staff members that were going to take part in the study to sign a consent form as well. As students and parents were also going to be taking part in the evaluation, the students and their parents needed to sign a consent form. After the staff of the school signed the form, a form went home to parents to return. The educator was contacted via email to ensure that my presence was going to fit well with the delivery of the programme. Once all participants were well informed of the scope, purpose, and methods of the study, it was then time to gather the data. The data collection was over one week, the typical time ZWE would spend on a unit with one class. The educator delivers different lessons one after another to different classes, however, the unit chosen for the evaluation was the composting unit and the observations were made in just one of the three classes running the unit that week. A contextual description of the school is provided in Section 4.3.1.

### **3.5.2 Interviews**

The interviews in this study were used to gain a detailed picture of what happens when the Zero Waste Education programme comes into a school as well as to answer the research and evaluation questions. The interviewees were given an informed consent letter detailing the purpose of the interview and research. All interviews were one on one, in a quiet setting to ensure that in-depth discussion could take place and that there were no distractions. All interviews were recorded and a transcript was provided to the interviewees to approve and amend as they felt necessary.

#### **3.5.2.1 Caretaker Interview**

One interview was carried out with the caretaker of the school. The interview consisted of nine questions that focused on the waste management practices around the school (see Appendix D). This interview lasted about ten minutes and the interview was a semi-structured one that was carried out after school early in the week of data collection. The purpose of the interview was to determine what the waste management practices looked like in the school in order to get a clearer picture of the extent of the whole school approach towards waste education.

#### **3.5.2.2 Head Teacher Interview**

One interview was carried out with the teacher who liaises with Zero Waste Education. This interview was thirteen questions long, was carried out before school, and took about fifteen minutes (see Appendix E). The interview was semi-structured, as some probing needed to occur

to get deeper data. This interview focused on the waste management practices of the school, expectations of the programme, as well as the interviewee's experience liaising with the programme.

#### 3.5.2.3 Classroom Teacher Interviews

Three classroom teacher interviews were carried out, each one consisting of the same questions. The teachers were chosen as they were having the compost unit being delivered in their class in the week of data collection. The interview was again semi-structured, and consisted of thirteen questions (see Appendix F). The interviews were used to gain a detailed snapshot of the class, the teachers' perceptions of the delivery of the programme, as well as to gain any insights into the effectiveness of the programme. The interviews took about ten minutes each and one took place at the end of the week at lunch break, one took place during the teacher's release day towards the end of the week, and one took place before school one day of the data collection week.

#### 3.5.2.4 Zero Waste Educator Interview

One interview was carried out with the educator that was working in the school for the week. The interview was thirteen questions and was semi-structured (see Appendix G). The questions ranged in topic from the educator's experiences with working in the school and experiences working for the programme. The educator requested a copy of the interview before the interview took place, thus giving the educator opportunity to prepare responses. The interview was carried out after school on one of the days in the week of the data collection.

#### 3.5.2.5 Interview Data Analysis

The interviews were all audio recorded. Therefore each interview was transcribed by listening closely to the interviews and typing the conversation. A copy of the transcription was provided to all of the interviewees to approve for use. No written notes were taken during the interviews as it was necessary to pay close enough attention to further probe responses if they needed clarification. Once transcribed, the interview transcripts were coded according to the goals of EE as specified by the *Guidelines* and the goals of ZWE. The themes were generated in a deductive way as the literature informed me of what themes I would be looking for in an evaluation.

### 3.5.3 Questionnaires

Three questionnaires were used for data collection; all three of the questionnaires were numbered 1-72, for the number of students in the three classes. The students were each

assigned a number that was the same number as their parents. The teachers kept the records of whose number went with whose name, in order to keep the numbering system anonymous to the researcher. The idea behind the numbering system was to triangulate the responses of the students with those of their parents, thus ensuring more valid reporting and allowing for more data to be produced. 25 questionnaires were used for data analysis.

#### 3.5.3.1 Pre Questionnaire

A pre programme questionnaire was delivered to all students in the three classes that were going to have the compost unit delivered in the class. Two of the classes had the questionnaires delivered the Monday of the week of the programme delivery, and one was delivered on the Tuesday morning before their first session in the programme. The questionnaire was ten questions long, and it was based on ideas that the programme intended to cover over the week, according to the ZWE planning documents (see appendix H). The students were reassured that the questionnaire was not a test, and that there were no wrong or right answers, so there was no need to stress. The questionnaire was distributed to all of the students in the three classes, but upon collecting them they were sorted by which children had returned their consent forms from their parents and those that had not, thereby keeping the ones without consent in a different pile for exclusion from the data analysis.

#### 3.5.3.2 Post Questionnaire

The post-programme questionnaire was delivered on the last day (Friday) of the week after each class had been through the ZWE programme. The questionnaire had the same ten questions, as well as seven more questions based on the children's intentions, attitudes, and enjoyment of the programme (see appendix I). As with the pre-programme questionnaire, the questionnaire was distributed to all of the students in the three classes, but upon collecting them they were sorted into piles, thereby keeping the ones without consent in a different pile for exclusion from the data analysis.

#### 3.5.3.3 Parent Questionnaire

The parent questionnaire was left for the teachers to send out the week after the ZWE programme delivery in the school. The teachers were asked to delay handing the questionnaires out to ensure that the students had time to discuss the programme with their parents before asking if the child had actually discussed the programme with them. The questionnaire was eight questions long and was sent home to those parents who had signed the consent letter (see

appendix J). The questionnaire sought to find out what information, and how much information, went home to the parents. Indicate how many questionnaires were returned for analysis.

#### 3.5.3.4 Questionnaire Data Analysis

Data was analysed on a spread sheet using Microsoft Excel. The questionnaires were coded to provide responses to the analytical framework, in which themes were deduced from the goals of EE from the *Guidelines* as well as the ZWE goals. The justification of the scoring methods for the student pre- and post-programme questionnaire can be found in appendix M, and the justification of scoring methods for the parent questionnaire can be found in appendix N. Analysis was carried out by tallying the scores of the questions and determining the mean value and the standard deviation. The mean value was used in order to get a picture of the average for the class, and to understand the general consensus among the participants. Standard deviation was necessary to examine the variation from the average to understand the diversity of views of the participants. These scores were compared from the pre and post questionnaire which gave an indication of any apparent change over the ZWE programme period.

#### 3.5.4 Observations

Four observations were carried out as part of the data collection as well. The four observations were of each of the compost unit's lessons, and were carried out in the same class on four different days. There were three separate sheets for the observations that were created (see appendix K). One of the sheets was to record the teacher's actions and to record the students' responses to those actions. One of the sheets was to make notes of evidence of the theoretical principles which were being investigated for the evaluation. The final sheet was a series of questions to be answered immediately after the observation in relation to what was seen while it was fresh in the researcher's mind. The role taken for the observation was to sit quietly down the back of the room in order to make as little impact as possible i.e. non-participation.

##### 3.5.4.1 Observation Data Analysis

Upon completion of the four observations, all notes were typed in order to display them clearer. Analysis consisted of reading through these observations to code them for themes. Themes were coded according to the goals of EE as specified by the *Guidelines* and the goals of ZWE. The themes, like those of the interviews were generated in a deductive way as the literature informed me of what themes I would be looking for in the evaluation. The observations were carried out in order to see the unit being delivered which allowed comparison with the espoused goals of the ZWE programme and educator and teacher reports of what happened for them.

### **3.5.5 Focus Group**

The focus group was carried out in an empty classroom with four students who had just completed the four lessons of the composting unit in the classroom that had been being observed. This was beneficial as I knew what the students had just been taught which made it easy to relate to their responses. The focus group interview was ten questions long, and was used to further unpack the knowledge questions from the post-questionnaire, and also sought to determine the students' attitudes around waste and composting (see appendix L). The four students were chosen at random by their teacher. The focus group was audio recorded.

#### **3.5.5.1 Focus Group Data Analysis**

The focus group was transcribed and coded for emerging themes the same way as for the interviews.

## **3.6 Quality of Research**

To ensure that the research was quality, the methods and intentions were made as transparent as possible for the subjects involved in the research. This was through the consent letter as well as through conversations around the intentions of the interviews, questionnaires, etc. This transparency was thought to make the participants more willing to answer openly as they were aware of the intentions and anonymity of the study.

Furthermore, the research attempted to ensure the research was quality by ensuring that the sampling techniques were consistent with the case study strategy, as well as taking into account validity, reliability, triangulation, and ethical issues as described below.

### **3.6.1 Sampling**

As the case study research method was applied for this evaluation, a typical case sampling strategy as described by Lodico, Spaulding, & Voegtler (2010) was used. In the typical case sampling strategy, the individual participants in the study are chosen because they have "characteristics or experiences that are representative of others" (Lodico et al., 2010, p. 36). For this case study, the school was chosen as they were having the ZWE programme in the school, and had had the programme in the school in previous years. The participants were chosen to be the ones doing the composting unit, as the participants would have had experienced the ZWE programme in other units before in their earlier years at the school. This fits the typical case sampling strategy, as these characteristics would be representative of other schools in the same circumstances, which was thought could be represented by the case study.



### **3.6.2 Trustworthiness: Validity, Reliability and Triangulation Issues**

Validity was enhanced for this study by using literature and the analytical framework (Appendix C) to formulate my research instruments and interview questions. One validity issue arose from the transcribing of the focus group with four students. In reviewing the recording it became obvious that two of the four children chosen were rather quiet and shy. This led to the focus group being a rather quiet experience for all involved, and the few questions asked did not allow for the children to open up enough. It was near the end of the focus group that the students began to talk a bit more, which meant that perhaps more in-depth responses could have been attainable had there been more icebreaking questions. The validity could have been enhanced by piloting research instruments before the data collection, but in this case, this proved impractical.

Reliability was addressed by giving participants opportunity to read through their transcripts to make any changes. This was done as this is a qualitative study which drew on participants' constructions of reality, therefore to ensure trustworthiness participants should be able to clarify any misinterpretations.

Another aspect of the study, triangulation, was used in several ways to further enhance trustworthiness of the data. In one respect, it was used to triangulate the answers that the students gave alongside what their parents said. In another sense, the use of multiple data methods allowed for triangulation between the teacher interviews and the observations, between the educator and the teachers, and the caretaker and the teachers, and the focus group and the teachers. This enhanced reliability as triangulation is used to compare data from different sources to get perspectives from other sources as well as to confirm evidence (Lodico et al., 2010). This was used mainly to determine if the child had in fact taken home the messages of the ZWE programme, and what those messages were, but it proved beneficial when looking at all data sources to create an entire picture for reporting. Triangulation used in this way increased the trustworthiness of the findings of the research especially in relation to intergenerational transfer.

### **3.6.3 Ethical Issues**

There were ethical issues that needed to be clearly thought through before conducting the data collection. Ethical issues were dealt with regarding informed consent, security of the information collected, the data collection, access to participants, transcription of the interviews and

reporting the findings. This research was undertaken according to the University of Waikato Human Research Ethics Committee's guidelines and procedures.

All of the interviews, observations, and questionnaires were carried out at times convenient to the participants. Approval to access all participants was gained first from the principal of the participating school, and the principal was aware of when the data collection would be taking place.

### **3.7 Chapter Summary**

To summarise, this chapter detailed the research methods and questions, as well as the methodological considerations for this qualitative case study. This study was in the interpretivist paradigm, as the evaluation was interested in the participants' perceptions of the knowledge they acquired and their behaviour as they went through the programme. Therefore, combinations of both qualitative and quantitative methods were used to best understand this.

Due to the scope of the research, the case study method as described by Yin (2009) was employed. In the case study there are a number of tools and techniques available to researchers for collection of their data. Each of these tools has specific instances in which they need to be employed, and their use is up to the researcher. For this case study evaluation interviews, questionnaires, observations, focus groups, and document analysis were used. Each of these has theoretical ideas underpinning their use, as well as numerous uses of each tool suited to the researcher's needs. These theoretical underpinnings were kept in mind during the development and application of the instruments.

Data was collected by interviews with each teacher who had the compost unit in their class, an interview with the caretaker, an interview with the head teacher who liaises with ZWE, and an interview with the ZWE educator. Additionally, 25 pre and post programme questionnaires were given to the students and 14 parent questionnaires were returned by participating parents, and one focus group was carried out with randomly selected students. Trustworthiness issues of reliability and validity were addressed by constructing the instruments based on current literature, allowing interview participants to read through their transcripts and make any changes, and triangulating data between all of the different data sources.

The next chapter summarises the data that was collected in the evaluation.



## Chapter 4 Findings

### 4.1 Chapter Overview

This chapter presents the findings that emerged from the data collection and analysis. The data is organised in three sections: the goals of the Zero Waste programme, the delivery of the ZWE programme, and the outcomes of the ZWE programme.

### 4.2 Goals of the ZWE Programme

This section examines the goals of the ZWE programme from the perspective of the ZWE staff as well as the goals and outcomes that the school teachers had in mind for the ZWE programme to be delivered in their classrooms.

#### 4.2.1 Goals as Defined by ZWE

As the evaluation is utilization focussed, the goals of the ZWE programme played a major part in the development of the research instruments and data collection. The relevant goals of the ZWE programme as supplied by the programme are as follows:

**Aim: A dynamic and comprehensive waste education programme that suits the needs of the end user**

**Related Objectives:**

- Continue to develop content that educates both the student and their families.
- Continue to develop a programme that can be incorporated into a teaching curriculum.
- Continue to meet councils' specific needs in terms of meeting their requirements of the Waste Act.
- Continue to develop wide-ranging yet specific units of content to suit different age groups.

**Aim: Build a team of dynamic educators capable of working independently**

**Related objectives:**

- Have a generic timetabling process for educators to follow.
- Provide educators with generic teaching resources that are updated as required. (Personal communication, Bruce Trask, June 27<sup>th</sup> 2013).

These goals alongside the theoretical goals as discussed in chapter 2 informed the thinking around the construction of the evaluation framework that guided the creation of the data

instruments. In the data collection the intended outcomes of the ZWE programme from the perspectives of the teachers in the school were also investigated to further inform the evaluation.

#### **4.2.2 Goals Defined by Teachers**

In the interviews with the teachers, their own goals for the ZWE programme were investigated through the question: What were you hoping your students would take away from the programme? This was asked with the intention of identifying their reasons for having ZWE in their classrooms and their goals for their students' development. Key reasons that emerged from the data were that the ZWE programme fitted well with the school's culture, and that the student outcomes in terms of learning for the future, and intergenerational transfer, were important.

For example, one teacher, Julia, mentioned that the ZWE programme fits in with the culture that the school is trying to achieve, and the programme is a good way to reinforce ideas that the school culture embraces. She said:

It's a good way to reinforce the stuff we talk about anyways. It's a lot more hands on, we do a lot of , it's not a unit as such, it's a culture we are trying to create, so when Renee comes in, its intensive, it pulls together a lot of the stuff we have talked about(Julia, Interview).

Another teacher, Brenda, described the ZWE programme as a small part of the big picture of the school's aim, helping the students to become prepared to take on roles in the senior school that are linked with running the composting/worm farms, as well as other enviro-projects that senior students take charge of. She commented:

As they head into senior school, they run the composting, they run the worm farms, they are responsible for the reserve, and there are a number of enviro-projects they are responsible for. These kids are being prepped very well to take on those leadership roles in regards to being an Enviro-school and Zero Waste fits in perfectly. ZWE is like a smallish part of the whole big picture (Brenda, Interview).

A second goal was achievement of student outcomes such as learning for the future and the intergenerational transfer that the ZWE programme goals had emphasised. Another teacher, Kate, stated her understanding of the goal was for students "just to be more conscious of what's going on around them and to know it's their future to look towards. And hope they carry it on

and want to learn more about it” (Kate, Interview). Her colleague, Leanne, added that she hoped student outcomes would be:

Knowing how to make a worm farm and taking that info home. Using that information to be aware and doing the things they should be doing because they need to clean the mess that my generation has made. So it’s taking that knowledge and using it (Leanne, interview).

Julia also discussed that overall she wished the students can pat themselves on the back when they finish because they know a bit more, and “we’d hope that they would carry it on in some way, even in a little way” (Julia, Interview).

#### **4.2.3 Summary of Goals**

From these information sources, the goals can be summarised succinctly. The ZWE programme has the goal of achieving intergenerational transfer through the ZWE programme, with the goals that the programme is relevant to the age of the student and that it is congruent with the New Zealand Curriculum document. The ZWE programme also has the goal of having a team of independent educators that are supplied with appropriate teaching resources and timetabling procedures.

The goals for the teachers can be summarised by saying that they wanted the ZWE programme to fit with the school culture, as well as providing the students with an awareness of the issues that we are faced with in regards to waste management that will enable them to put the information to use to take action, particularly at home.

In this case study, it seems the ZWE programme fits well with the intentions of the school. The school is trying to create a zero waste culture and embraces the themes that ZWE brings into the school. The programme is then a good match for this school as the teachers’ goals aligned with the goals for ZWE with respect to the intergenerational transfer expectation, as well as educating students about waste management

#### **4.3 Delivery of the ZWE Programme**

Now that the goals of the ZWE programme have been discussed, the context of the school in which the case study took place is described. The preparation of the students before the ZWE programme was delivered, as well as the ways that the school supports the programme, is also discussed.

### 4.3.1 School Context

The school is located in the Bay of Plenty of New Zealand, and is a small country school with a decile rating of 5. This school is in a horticultural region, and as the ZWE educator stated, many of their students have experience working with the land (Renee, Interview). This school is also an enviroschool, and has received a Green-Gold rating and the school works with a lot of environmental themes, which became apparent when conducting the interviews. This Green-Gold rating is the highest award that Enviroschools has, and in order to qualify for this award the school must demonstrate that environmental sustainability is part of the whole school life, and that the school holds a strong connection to the environment whereby all action and enquiry at the school is mainly lead by the students (Enviroschools Foundation, 2009). Julia is the liaison teacher for Enviroschools as well as ZWE, and she explained that the school has been an Enviroschool for 8 or 9 years and has been having the ZWE programme come in for about that long too.

Being an established Enviroschool, the school has a range of waste management practices in place. The school caretaker, Brent, explained that there is a staff room recycling bin, paper and cardboard recycling around the school, glass recycling, food scraps are collected and put in the school compost, aluminium and steel recycling that gets sent to a metal scrapper, as well as recycling of plastics of all grades accepted by the local district council (Brent, Interview). The school also collects yogurt containers, which are kept out of students' lunchboxes "to keep them from getting messy" (Julia, Interview). This was part of a student-lead initiative to recycle them, and the students worked alongside the caretaker to construct the trolleys that they are collected in. According to Brent, this student-lead initiative came about from the students' work with Enviroschools (Brent, Interview). Julia mentioned that the school used to reuse the yogurt containers but now they have an abundance of them so they are disposed of (Julia, Interview).

Furthermore, the school is a zero waste lunch school, meaning that the students are not meant to bring anything in their lunch that will make rubbish, or if they do, the rubbish is to go home to be disposed of. Julia remarked on the process for informing parents of new students about this school aim:

When somebody enrolls there's an enrolment pack, and in that we have a flyer that says we are a zero waste school and in that it tells how to have a zero waste lunch (Julia, Interview)

#### **4.3.2 Student Preparation**

Being in the interpretivist paradigm, this research project recognises that the content knowledge that any student has before a teaching intervention may vary in different contexts. In order to reflect this it was important to investigate the level of preparation that the students had before the ZWE educator began delivering the ZWE programme.

The ZWE programme provides the school and teachers with an inquiry learning unit plan that is designed to be used in a 2-3 week period, including the week that the ZWE educator comes in to teach (Zero Waste Education, 2013a). Zero Waste states that:

Unit plans are provided prior to the visit to assist teachers in undertaking curriculum planning for both pre and post visit learning in class. Included in all ZWE unit plans are suggested hands-on extension activities, writing tasks and links to journal stories (Zero Waste Education, 2013a, p. 4).

This document is provided to the school after the school has confirmed the booking. For this particular school, the booking was made in Term 4, 2012, approximately 3 terms before the teaching would be taking place. It would appear to be that this is ample time for the school to utilize the unit plan and incorporate it into the teaching for the term if they choose to.

As this unit plan was provided well in advance, teachers of the school were asked if they had done any teaching around the unit beforehand. None of the three teachers had done any specific teaching on compost, which was the topic delivered by the ZWE educator; however, Brenda mentioned that the ZWE programme supplements what is already going on rather than being a specific focus. This is because the students all have their gardens or their enviro-projects that they are involved in (Brenda, Interview).

Another important piece of contextual information gathered to inform the study was the school's experiences with liaising with the ZWE programme.

#### **4.3.3 Liaising with ZWE**

As mentioned earlier, Julia is the teacher who liaises with the ZWE programme and educator. When asked about her impressions of the organisation of the ZWE programme Julia was pleased with the way the organisation runs. Julia felt that the unit plans being sent prior was beneficial for the classroom teachers as they have the opportunity "to talk about it in their class or at least get their head around it" (Julia, Interview). This process of receiving the unit plan in advance was



reaffirmed in the interview with Brenda, as she said that generally the educator brings the teaching booklet with the plan to the class when he/she comes in, however, all of the resources are also emailed through in advance (Brenda, Interview).

Julia also expressed admiration for the flexibility of the ZWE programme and the educator in past years, and specifically recounted a time “a few years ago” where the educator came in during Conservation Week and put on a workshop for parents and grandparents of students in the school to teach them about composting (Julia, Interview).

#### **4.3.4 School Support for ZWE**

In this case study it was important to consider the level of support that the school provided for the ZWE programme coming in to the school as this could have an impact on the overall outcomes of the study, as according to Bolstad (2003) children learn through messages in the surroundings, practices, and principles of the school. A substantial amount of support for the ZWE programme emerged in the data.

As mentioned above, this school is a Green/gold enviroschool. From the data collection it was apparent that the school had well established their waste management practices around the school. The school is supportive of the students’ initiatives around taking action on issues, as mentioned in the caretaker’s interview when he described the students’ initiative for collecting and reusing yogurt containers. This was reaffirmed by all of the classroom teachers’ interviews, for example, Brenda, who had been teaching at the school for nearly 24 years, stated that the programme has “obviously made an impact around the school as we are an enviroschool and it totally supports our philosophy and the way things operate” (Brenda, Interview).

The school had a section of their grounds dedicated to a school garden which was well established and functioning. The school had a very large compost heap which looked quite well maintained; this was an indication that the school supports the messages that were being delivered in the compost unit that was the focus of this evaluation study.

Furthermore, the teachers’ interviews specifically mentioned things that the students were involved in that they support. Brenda, as mentioned above, made reference to the ZWE programme as being part of the big picture of the school culture that is trying to be achieved. This was also demonstrated in Kate’s interview when she was prompted about the ways that she prepared her class for the teaching that would take place when she said:

We do an enviro-project in our class and we do zero waste lunch, and we check [the lunches] in the morning. It's just a school thing, they've had it when they were younger and they know anyways what they are going to get [delivered] (Kate, Interview).

The idea of a whole school culture was also mentioned by Leanne when she was prompted about her plans to carry on her students' learning after the ZWE programme. Leanne declared:

Yeah, we will keep them going about composting with our class movie, talking compost and about balance. And because the school is so environmentally aware they will keep that going all the time. (Leanne, Interview)

#### **4.3.5 Programme Delivery Summary**

To summarise, the case study school is an established enviroschool, with a range of waste management practices in place that indicated they support the messages of the ZWE programme. It was indicated that there was no explicit teaching beforehand around compost in any of the classes involved in the programme delivery, however, the messages around waste are a part of the school life and the teachers felt that the messages would supplement what was happening around the school. The teacher that does the liaising with ZWE was happy with the way things are organised, and was happy with the flexibility of the ZWE programme and educator.

Now that the context of the school has been clarified, the outcomes of the ZWE programme can be presented in this case study's context.

#### **4.4 Outcomes**

The outcomes for this case study have been split into four sections. These sections relate to the desired outcomes of environmental education as a whole, as well as the desired outcomes of the ZWE programme itself.

The first section, knowledge outcomes, relates to the 'about' dimension of the 'about, in, and for' formula for EE programmes, as well as the goals from the *Guidelines of Environmental Education in New Zealand Schools* document's aims for EE to develop "knowledge and understanding of the environment and the impact of people on it" (Ministry of Education, 1999, p.9).

The second section, the attitude and awareness outcomes, relates to the *Guidelines* document's 'in' dimension, and the third aim of environmental education "attitudes and values that reflect

feelings of concern for the environment” as well as their aim for students to develop “awareness and sensitivity to the environment and related issues” (Ministry of Education, 1999, p. 9).

The third section, action and participation outcomes, relate to the ‘for’ dimension of the ‘in, about, for’ formula, as well as the aims of the *Guidelines* document’s “skills involved in identifying, investigating, and problem solving associated with environmental issues” and the aim of developing “a sense of responsibility through participation and action as individuals, or members of groups, whānau, or iwi, in addressing environmental issues” (Ministry of Education, 1999, p. 9).

Lastly, the fourth section refers to the aim of EE as well as the aim of the ZWE programme, which is intergenerational transfer. This is addressed specifically in the ZWE aims which state that a programme objective is to “continue to develop content that educates both the student and their families” (Personal communication, Bruce Trask, June 27<sup>th</sup>, 2013).

#### **4.4.1 Knowledge Outcomes**

In this section the findings of the knowledge development of the students over the course of the week are reported. Initially described are the intended knowledge outcomes by way of analysing the ZWE documents and referring to data that arose from the observations. Then the knowledge development is reported as analysed in the questionnaires, focus group, and interviews with teachers. It must be acknowledged in the reporting of any knowledge findings, any perceived rise or decline of knowledge is hard to accurately attribute to the ZWE programme as students may have a range of information sources coming to them regarding environmental issues (Carleton-Hug & Hug, 2010)

##### **4.4.1.1 Lesson Plans**

As each educator in the ZWE programme is supplied with a set of lesson plans for each unit, the assumption is made that every unit delivered covers the same material regardless of what school it is delivered in. Obviously this can vary from school to school depending on time availability and the class itself. However, for the composting unit the lesson planning documents were analysed and here the knowledge that is expected to be transferred in each lesson is reported.

In the first lesson of the unit the educator initially runs through some facts about waste and landfills, and introduces the unit and what is expected to happen over the week. The educator then moves onto the benefits of composting, the different designs of compost bins, as well as

what finished compost is. The lesson then turns to looking at what types of materials can go in to the compost bin, and then categorising these materials into a simple 'carbon' or 'nitrogen' and the students go into groups to practice these concepts with a quick game. The students are then given the homework task to be completed by the next session, which in this first session is simply bringing materials for making their compost bins. An additional activity is planned if there is available time which is describing to students how easily food is broken down in a compost bin rather than in a landfill. The students are then set on to a workbook activity that requires them to sort some materials into 'carbons' or 'nitrogens', and then to list things that cannot be composted.

The second lesson begins with a short reminder to bring the materials to make a compost bin, as well as a small revision of the previous lesson. The next activity is a repeat of the additional activity in lesson 1, which is just looking at how food in a landfill is not exposed to sunlight/rain/air, and leachate and methane gas is produced. The lesson then goes into vermicomposts and thermophilic composts and their differences, and the educator takes the class to look at the school compost bin if the school has one. The next activity is an investigation of what type of soil is in their school garden. Students are put into groups and given a plastic jar, in which they put soil, water and dish soap. The students shake it up and the idea is that by the end of the lesson they will see how much organic material, sand, and silt is in the soil. Next the students are led to a tree on the school grounds and are told they can feed trees their finished compost. The students are sent to stand where they would dig a trench around the tree and fill with compost. Most students go to the trunk of the tree and then are told about the drip line and how trees send feeder roots out to the drip line. Next the students pretend to be trees and must point to where their feeder roots are and where they would be fed. Finally, the students return to class to work on their workbooks which recap what they have learned this session and are again reminded to bring materials for lesson three.

Lesson three is the lesson in which students are given the recipe to make their compost bins and then they set out to make them. Students are expected to have their compost bin approved by the educator before they are finished. Early finishers help the slower students.

Lesson four starts out with an information/tips session on how to store and care for compost bins and some common problems are addressed (smelly, too wet, etc.), as well as a questions session for the students to ask anything they need to regarding composting. The educator then gives three students some props to act out a news interview with a worm that lives in a compost bin. One student is a scientist, one is the interviewer, and one is the worm. This interview is

packed with information about composting that the students can use to complete their workbooks. After the interview skit the class is split into three groups, one will watch a video about composting, one group will work in their workbooks, and one group goes outside to a mat that has some finished compost on it. The group looking at the finished compost uses magnifying glasses and sticks to have a good look through it. The groups all rotate so that all students have an opportunity to do each activity. Once the students have done each activity, there is a final review where they are reminded to take their composts home and are told what they can expect to learn the next year that the educator comes in.

As well as the lesson plan analysis, four observations of these plans in action were carried out.

#### 4.4.1.2 Observations

Observations of each lesson were carried out in the data collection. The templates for observation allowed for rich data to emerge as a result (see Appendix K). Here additional data on the students' knowledge development and engagement with the lesson are reported with specific mention to the outcomes on the observation sheet which is: harnessing students' curiosity, giving students opportunity to take responsibility, experiential learning, collaborative and participatory approaches, exploration of prior understanding, and opportunities to discuss views and challenging of student views. Key findings indicate that the lesson delivery was consistent with the lesson plans.

The first lesson observation showed consistency with the lesson plan that ZWE provides the educator. Students demonstrated a high level of engagement and appeared happy to participate and listen. Students were given an opportunity to question and the educator was effective in harnessing their curiosity throughout the lesson. Most, if not all, students were participating, particularly when contributing ideas around what nitrogen and carbon are when dealing with food waste. The educator explored the prior understanding of the students. This was done through questioning, for example, "How many of you have compost at home", and "Who thinks they can give an example of what we put in?" (Observation 1, 10 September 2013).

Students' views were challenged in one particular instance where students were in disagreement about whether or not tea bags could be put into the compost. The educator took the opportunity to work through the predicament with the students.

The second lesson observation was also consistent with the lesson plan provided by ZWE to the educator. Again in the second lesson the students appeared to be engaged and attentive to the

educator's messages. The educator recapped on the previous teaching session to help the students focus back in to the messages. The students' curiosity appeared to be harnessed throughout the lesson, and particularly when the students went to look at the compost bin, and when they were doing the dish soap with soil activity. Students were also given the opportunity to discuss their views, which were then challenged by the educator when the class was looking at the compost bin. The educator asked them "Why are the compost bins black?" and "Why is there no floor on a therm-a-compost bin?" (Observation 2, 11 September 2013). This was an invitation for students to discuss their thinking. There was also an opportunity for students to collaborate during the activity where they sorted carbons and nitrogen's.

The third lesson observation was again congruent with the intended delivery. As this lesson was the lesson where students made their compost bins, it was a very full on time and the students were constantly engaged. There was no recap on the previous session; however, this appeared to be because of time restrictions. The students had the opportunity to take responsibility in the construction of their compost bins. The students were following a recipe, however, there was still a high level of individual judgement on what they should be doing. This lesson was in an experiential learning context as the students were experiencing making compost for themselves, and this was in a collaborative approach with other students. This collaboration came mainly from discussions between students about the layering of carbons and nitrogen's. There was plenty of questioning in this lesson by the students about how well their composts were coming along.

The fourth lesson was also congruent with the lesson plans. The educator recapped on previous knowledge through a question and answer session at the very beginning of the lesson. Again in this lesson there was a high level of engagement, specifically when the students went outside to look at the finished compost. The students' curiosity was harnessed through the compost activity where the students were looking through the mat. In this activity, the students were constantly asking questions about the worms and other organisms they came across. A few specific questions were: "Do our hands hurt worms?" and "Is that a worm egg?" and "How long do they live?" (Observation 4, 13 September 2013). The learning on the mat was a collaborative participatory approach, as there was rich discussion between the students about the worms and their identification, drawing on the learning from the previous lessons. The knowledge in the worm interview skit appeared to reinforce those ideas.

#### 4.4.1.3 Questionnaires

Students were asked to complete a questionnaire before and after going through the ZWE programme (see appendices H&I) that covered concepts that the ZWE lesson plans indicated they would be exposed to during the course of the unit. Additionally, the post-programme questionnaire had questions around the students' intentions, attitudes, intergenerational transfer, and enjoyment of the ZWE programme. Due to absences, the sample size of students that completed both the pre and post questionnaire was 25 students. The findings around knowledge development indicated a raise in composting knowledge, as well as a perceived level of knowledge development by the students.

The questions in the pre and post questionnaires addressing knowledge development around composting were questions 1, 2, 4, and 5 (see Appendices H & I). The development of knowledge is represented in Table 4.1.

Table 4.1

<i>Knowledge Development over the Unit</i>				
Question (Possible Score)	Pre questionnaire average score	Post questionnaire average score	Standard Deviation (Pre)	Standard Deviation (Post)
1.Compost Definition (3)	2.28	2.44	0.960	0.893
2. What is compostable (6)	3.56	5.6	1.492	0.627
4. Food in landfill (5)	1.28	3.28	0.485	1.068
5. Using compost (3)	1.24	2.04	0.402	0.675

Question 1 was based on knowledge of what compost is, and is derived from meanings of what compost is from Wilson and Feucht (2013), Zero Waste Education (2013b), and US EPA (2013).The scoring of responses was done by defining the meaning of composting from these three sources and using it to create three levels of definitions (see Appendix M). To illustrate

further, the highest possible score as seen in Table 1 was a 3, or option C. This was gathered from the definition of composting from the EPA, and the definition from ZWE, and the question was written to identify if students understood that rather than simply being broken down food, compost is useful to put nutrients back into the garden. As seen in Table 4.1, students prior to the ZWE programme reported a sound understanding of what compost is, and this appeared to have improved slightly after the composting unit. The smaller standard deviation in the post questionnaire data indicates less variation for this answer across the student group.

Question 2 was based on what students know to be compostable. The question listed a range of options of items that can and cannot be composted and the students were instructed to circle the options that they thought could be composted (see Appendix M). The answers were coded based on definitions of what compostable material is, defined as from the US EPA (US EPA, 2013) and ZWE (Zero Waste Education, 2013b). There was a rise in average score with this question from the pre to the post questionnaire, indicating that the students on the whole appeared to have gained knowledge about what can be composted. As Table 4.1 shows, the standard deviation on the pre-programme questionnaire was larger than the post. This demonstrates that initially the students had a wide range of answers, but by the end the students had a clearer understanding of materials that can break down in compost, hence the smaller number for the standard deviation.

Question 4 was based on what students believe happens to food scraps in landfills. The options were based on ideas that were taught in the lessons about the production of leachate and methane gas in landfills, as well as the idea that worms and bugs are still able to break down food scraps in the landfill (see Appendix M). In the pre-programme questionnaire, the average score was 1.28 with a standard deviation of 0.485, as many students responded that rubbish stays the same or that worms eat it, as they had not yet been exposed to the idea of methane or leachate production in a landfill. In the post questionnaire, however, there was a rise in average score which indicated that students appeared to have developed understanding that leachate and methane gas are waste by-products in landfill, as more students circled these items in the post questionnaire, leading to higher scores. The high standard deviation for this question in the post-questionnaire could be explained by the observation that even though a lot of the students developed their understanding here, not all of the students picked up on the leachate/methane production ideas. It should also be noted that only three out of 25 students indicated that worms eat food scraps in a landfill in the post questionnaire, whereas 16 of the 25 students indicated that worms eat food scraps in the pre questionnaire. This could be because the ZWE



programme does not specify in their lesson plans that there are worms in a landfill which may have had an effect on this score.

Question 5 examined what finished compost can be used for. The options were defined by ZWE in their lesson plans as well as from Wilson & Feucht (2013), and the only option that was considered an incorrect answer was option C, putting compost in the rubbish. Many of the students in the pre questionnaire chose one option whereas in the post questionnaire many of them chose two or three options. This may indicate that the students had more ideas of what finished compost can be used for, however, the standard deviation was higher in the post-programme questionnaire meaning that there were a varied range of answers. This could indicate that the students were either not aware that they could circle three options for this question, or possibly that not all students were aware of the range of options for using finished compost. Furthermore, two students indicated in the pre questionnaire that you can put compost in the rubbish, whereas only one student indicated this in the post questionnaire. Overall then for this question, students built on their prior knowledge of what to use finished compost for.

Furthermore, the students' perceived knowledge development from participating in the ZWE programme was probed on the post questionnaire in Question 17 where they were asked about how much they felt their knowledge had improved after the unit. The students' perceived knowledge development was very high with an average score of 1.89 out of a possible 2. This indicates that the students felt that they learned a lot of new information about composting that they had not previously known before the ZWE intervention.

#### 4.4.1.4 Focus Group

As discussed in Chapter three, the focus group was a rather quiet experience. Significant levels of data did not emerge; however, there was some discussion around knowledge development.

When the students were asked about what sorts of things they had learned about during the ZWE programme, there was a focus on worms. The students indicated that they learned about how big worms are, they learned about their eggs, as well as a broad understanding of 'worm facts' (Student focus group). Students also said they learned how to make a compost bin, and that they learned new things about landfills like what leachate was, which was also indicated in the questionnaire responses.

When asked if they felt differently about waste having been through the ZWE programme, students indicated that they knew how to compost properly now, and that they learned how to reduce food scraps going to landfill. This appears to triangulate well with the students' responses in the post-programme questionnaires. The students' average scores showed that they already had some knowledge around composting in the pre-programme questionnaire but the students as a group showed gains in the knowledge areas of these questions in the post-programme questionnaire.

#### 4.4.1.5 Teacher Interviews

The three teachers whose classes had participated in the ZWE programme were interviewed individually near the end of the week. When prompted about the sorts of changes that the teachers had seen in their students that have gone through the ZWE programme, some participants' responses were directly related to knowledge development that has affected their students' perceptions and practice.

Brenda made the observation:

Now as they've come through the school kids are maybe not aware of why they have put things in the green bin. But after spending time with [the ZWE educator] as she comes through the school each time, they are more and more aware and it makes a lot more sense to them. So they aren't just doing it because they were told, but they see there's a purpose. All the messages that [the educator] gives the kids are totally supported by their practice. (Brenda, Interview).

In addition to Brenda's observations, Julia made reference to something that stood out for her after having the ZWE programme in the school in the past:

Knowing the recycling stood out for me, the kids didn't understand what they can or can't recycle, this was probably 4 or 5 years ago now, and being able to look at the bottom of the plastics and being able to filter those, that was really good. That was one of those things that we never really covered (Julia, Interview).

Additionally, Leanne mentioned in her interview that students were talking about things to do with waste a lot more than they would normally be in her experience. One specific instance that she recalled was when her class was doing some planting and a child found a worm. Another student told that student to leave the worm alone and that the worm needed to stay in the ground (Leanne, Interview).

#### 4.4.1.6 Knowledge Summary

In summary, there appeared to be evidence of development in student knowledge through the week that the ZWE programme was delivered in the school. The goals of the programme and of the teachers for the development of students' knowledge did appear to be achieved as the data indicated that students developed their knowledge. The knowledge around what compost is, and what it can be used for, showed an observable increase between the pre and post questionnaires. This development demonstrated that students gained better understanding of how to tell if something can be composted, and they understand more what the implications are of sending food scraps to a landfill. As well as learning a lot about composting and its importance, new information about the importance of worms appeared to emerge. This was through the focus group, as well as a teacher's observation. Teachers noticed changes in students through the ZWE programme, and specifically changes in their knowledge of waste and recycling.

#### 4.4.2 Attitude/Awareness Outcomes

In this section the findings of the attitude and awareness development of the students over the course of the week is reported. To begin, the attitudes towards the waste messages and attitudes towards the ZWE programme are reported in separate sections. The awareness outcomes are then reported.

##### 4.4.2.1 Attitudes Towards Waste

The attitudes towards waste messages relates to the "attitudes and values that reflect a feeling of concern towards the environment" as specified by the *Guidelines for Environmental Education in New Zealand Schools* (Ministry of Education, 1999, p. 9). From the data collection there were clear attitudinal themes arising from the questionnaires, focus group, interviews and parent questionnaire. Findings that emerged from this data indicated that students were engaged with the composting unit and appeared to use their learning to inform their practices at school, and more than half of the parent questionnaires returned indicated that they noticed a change in attitude towards waste in their child after they had participated in the programme.

The questionnaire contained three questions based on the students' attitudes towards their perception of the importance of composting. Question 7 asked how important students thought composting was before and after they participated in the ZWE programme and Question 8 asked them to explain why they felt this way. As seen below in Table 4.2, a majority of the students indicated that composting was very important both before and after the ZWE programme. Furthermore, it can be seen in Table 4.3 that there was a very slight lift in the average score for

attitudes towards composting. This may be attributed towards the students' development of a more positive attitude around composting.

Table 4.2

*Student perception of importance of composting as indicated by questionnaires*

N=25	Not at all important	A little bit important	Very Important
Pre Questionnaire	0	4	21
Post Questionnaire	0	1	24

This data is interesting to triangulate with responses from question 8 which asked students to justify their responses. The responses from Question 8 were scored with either a zero, one or two based on the sophistication of the responses. Where students responded with a simple answer such as "very good for the planet" or "Helps things grow", they were scored a 1. Where the students gave a more sophisticated answer such as "In landfill they [fill up] quickly and it's good soil for crops" or "saves all the food scraps when you could give it to worms" they were scored a 2. There is an increase in the students' scores from an average score of 1.16 on the pre questionnaire to an average of 1.4 in the post questionnaire. This may indicate that the students may have the ability to justify their stance by saying composting is important in a more relevant way after going through the ZWE programme. This showed through in the responses, as many of the students in the pre questionnaire stated very general reasons like 'composting helps the world', but in the post questionnaire they were able to explain their logic with ideas that were taught during the ZWE programme, such as the recycling of nutrients and the production of leachate and methane gas.

Finally, Question 10 asks the students to circle the option they agree with in relation to the statement: I feel that everyone should compost their food scraps. The question was scored from 0 to 2 based on the child's indication of concern. There was no change in score here, and this correlates with the school culture that the school fosters as children may have already the idea that composting was important for people to do.

Table 4.3

*Attitudinal development towards importance of composting*

Question (possible score)	Pre questionnaire average score	Post questionnaire average score
7. Importance of composting (2)	1.84	1.96
8. Explain (2)	1.16	1.4
10. Feel everybody should (2)	1.88	1.8

As well as data from the questionnaires, themes around attitudes also came out of the parent questionnaires that were returned. In reporting the findings of the students' perceptions of the importance of composting it is also interesting to triangulate this data with the parents' perceptions of the student's attitude change. The three questions related to attitude change on the parent questionnaires were Question 2, 7a, and 7b (see appendix N). Out of the 72 students going through the ZWE programme, only 29 students returned signed consent forms to participate. Out of these 29 questionnaires sent home for parents, only 14 were sent back. Therefore, when reporting key findings it must be noted that the findings are from a very small sample size. Nevertheless, key findings indicated that over half of the parents who returned a questionnaire had noticed a positive increase in attitude in their student towards waste; however, only a small number of parents reported enthusiasm or action towards waste. This is further illustrated below in Table 4.4.

Table 4.4

*Attitudinal development as indicated by parent questionnaires*

N=14	Number of parents reported positive change
Question 2 (Surprised by enthusiasm)	4
Question 7a (Noticed change in student)	9

Question 2 investigated the parents' perception of their child's attitude or enthusiasm for learning in the ZWE programme. As shown in Table 4.4, four of the parents reported that

students do not usually take much learning home and were surprised by how much the child shared at home about the programme.

Question 7a enquired about any change in interest or awareness around the topic of the ZWE programme. To score this question, the options “a little bit” and “a lot” were considered as a positive change in attitude. As shown in Table 4.4, 9 parents reported such a positive change. One parent described the positive change in their students with an example in Question 7b where they stated “Child is more interested and aware of waste. Responsible for worm farm.”(Parent 2).

Data from interviews with the teachers and the educator also indicated some attitudinal changes in the students. From the interviews, teachers indicated that they had noticed a change in attitudes around waste and concern for worms in students that have been through the ZWE programme and that it is showing through in their practice. For example, Brenda made a note of observations that she had made regarding waste reduction:

My classroom is used as the detention class. All kids come in knowing that they have to write lines or letters of apologies or whatever it is, and they will go directly to the tray with ‘this has been used on one side now you use on the other side’ paper, so that’s just normal, they don’t think of it as having to bring paper., they know there is a tray with paper for use. It’s just a part of them now they don’t have to be told (Brenda, Interview)

For her it is clear that students are changing their attitudes towards waste and this is showing through in their practice, however this is part of the school culture and cannot be necessarily attributed to the ZWE programme. As well as an attitude change towards understanding the importance of reducing our waste, an attitude change towards worms emerged in students. For example, Leanne made an observation regarding the students’ feelings of concern for worms:

They are talking about it a lot more than they would be. And worms, they like worms. We did some planting down the reserve and it’s like, Kelly is going like this (waving arm around with a worm) and somebody says ‘put it back, leave it alone, it needs to stay in the ground’. Little things like that. (Leanne, Interview).

In addition to showing more empathy towards worms, Renee, the ZWE educator, had noticed a shift in students’ attitudes around worms with a monetary focus, as well as pride in their worms. She stated:

Some are like 'oh gross', then the next minute they say 'oh I can get some money'. Especially when I tell the kids about [a worm fertiliser company], you know the waste from [the local town] they send to [the company], [the worms] poo it out, [and the company] put it in a nice bag and sell it as fertiliser. So I say well wouldn't you like to know where their fertiliser is coming from and wouldn't it be better if you made it yourself and they go 'whoa yeah'. I see the most amount of change with the compost unit. Really focussed and very proud of their worm farms and lots of questions as soon as I entered the class (Renee, Interview).

There was also some evidence in the data of attitudes towards the ZWE programme.

#### 4.4.2.2 Attitudes Towards ZWE Programme

Themes emerged from the data concerning the students' attitudes towards the ZWE programme. The attitudes towards the ZWE programme are related to engagement and enjoyment of the ZWE programme. Key findings indicate that the students were very engaged with the ZWE programme and felt very positively towards it, and that the varied types of learning in the unit kept students engaged.

It was apparent in every observation carried out on this unit that the students' had a high level of engagement and they seemed to enjoy each lesson. The high pace range of activities appeared to keep the students engaged and listening. Most students were actively participating in the lessons as well. This was further exemplified by the teachers.

Julia specifically mentioned this student engagement when she said:

Every time I ask 'Does everybody want to do it again?' Everyone says yes, nobody ever says no. (Julia, Interview).

This engagement was also a point of interest in Renee's interview when she discussed her enjoyment of teaching the composting unit:

The kids are into it, fully engaged. You get some kids that aren't good at the writing or whatever, even the behavioural ones; this is the best unit to teach them. Once you get out there they are just fully focused, all the boys are, you know, and sometimes they are the ones who want to muck around in the class, but once you get there they usually finish first on task, very proud and they really like it. (Renee, Interview)

These points were further exemplified in the parent questionnaires. Although there were no specific questions aimed at asking parents about their child's enjoyment of the ZWE programme, this theme did emerge from a few responses. This was evident in how students showed interest and concern about waste and worms. For example, one parent when asked about how much their child shared about their learning in the ZWE programme, and whether or not it surprised them (Question 2) stated "Yes – it's great they are concerned about it" (Parent 38). Another parent in response to the same question stated "Yes, how interested he is in it" (Parent 43). The third response was for Question 4, which asked about what the child shared with their parents at home, where the parent replied "[Child] enjoyed using magnifying glass & enjoyed facts about worms" (Parent 2).

While no large claims can be made about the parents' perceptions of the students' enjoyment of the ZWE programme, there was no data that reported a child did not enjoy the ZWE programme. These examples illustrate this, and the enjoyment of the students was further illustrated in their post questionnaire.

In the post programme questionnaire the students were given four questions based on their enjoyment of the ZWE programme and learning about composting. The findings of the three multiple choice responses can be seen in Table 4.5. Note, one student did not answer question 13, which explains the inconsistency with the N value. From these findings it can be seen that the students when prompted about having fun, their enjoyment of the educator and their learning about composting, a large majority of students reported that they really enjoyed the ZWE programme overall.

Some specific examples of the reasons given by the students that they liked the educator, as probed in question 15 included; "Because she is awesome at what she teaches." (Post-programme questionnaire, student 58), "Because I learnt a lot of new things." (Post-programme questionnaire, student 51), and "Because she made the lesson fun and taught me a lot of new things." (Post-programme questionnaire, student 46).



Table 4.5

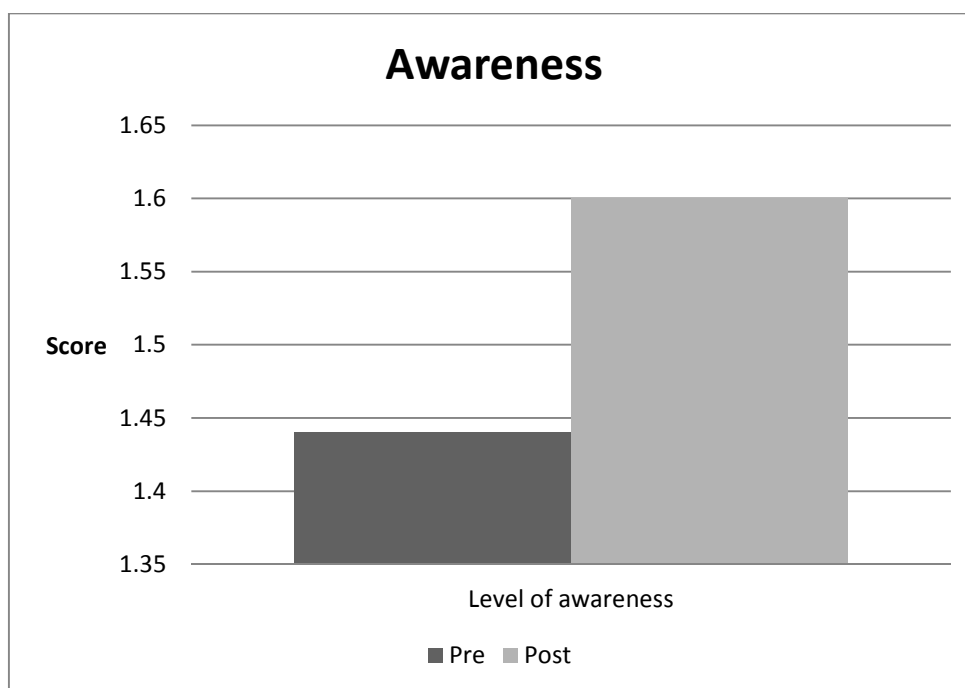
*Students' enjoyment of the ZWE programme*

Question	Not at all	A little bit	A lot
13. How much fun?	0	1	23
14. Did you enjoy educator?	0	3	22
16. How did you feel?	0	3 (It was okay)	22 (It was interesting and fun)
N=25			

As can be seen, the students enjoyed the ZWE programme. However, it is interesting to see the development of their awareness of waste management practices at home in comparison to their enjoyment.

#### 4.4.2.3 Awareness of Waste Practices

In the data collection, the students were asked one question on the pre and post questionnaire regarding their awareness of waste practices at home. This was Question 3 on the questionnaire regarding home practices. The data was analysed by comparing the responses in the pre against those in the post questionnaire, and this was scored by giving each available option a numerical value of 1. There was a total possible score of five, however, as every household has different waste management practices, there was no correct answer. A raise in score could indicate that the child became more aware of their home practices after the ZWE programme, as they may take more notice of what is happening to food scraps at home and circle other options they had not thought of before. There was a raise in score for this question. The average score on the pre questionnaire was 1.44, whereas in the post questionnaire the average score rose to 1.6 as shown in Figure 4.4.



*Figure 4.4: Awareness development as indicated in the questionnaire*

Although the parent questionnaire contained no specific question as to if the parents noticed an increase in awareness of household waste practices by their child after the ZWE programme, this data did emerge from one parent questionnaire response, indicating the possibility of transfer of awareness to home. The parent mentioned:

It has made him more aware of how much we actually do at home, and notices other people who may not do the same” (Parent Questionnaire 43)

#### 4.4.2.4 Summary

In summary, the attitudes and awareness section included attitudes towards the issue and attitudes towards the ZWE programme, and awareness of waste practices. The findings of the attitudes towards the issue were gathered from the questionnaires, focus group, interviews and parent questionnaires. Key findings that emerged from this data indicated that students were highly engaged with the composting unit and appeared to use their learning to inform their practices at school, and more than half of the parent questionnaires returned indicated that they noticed a change in attitude in their child towards waste.

The key findings of the students’ attitudes towards the ZWE programme were gathered from the observations, interviews, and parent questionnaires. The findings indicate that the students were very engaged with the ZWE programme and felt very positively towards it, and that the varied types of learning in the unit kept students engaged. The findings of the awareness of

waste practices indicate that the students may have become more aware of what happens at home through the ZWE programme.

#### **4.4.3 Action/Participation Outcomes**

As well as seeking to determine the knowledge and attitude/awareness changes in students, this study was also concerned with determining the development of action/participation skills of the students targeted towards helping the waste problem and overall participation in the ZWE programme. The data where action/participation themes emerged was collected through observations, the focus group, interviews, and parent questionnaires. Key findings indicate that action is taken in the lessons and that change has occurred in some students, however, due to the sample size it is hard to project this out for the rest of the ZWE programme. These findings now are discussed in sections related to the themes that emerged from the data.

##### **4.4.3.1 Students' Participation in the ZWE Programme**

From the observations arose themes regarding action taking and participation. The most prominent of these themes was the participation of students in actively contributing ideas to the lessons. This was noted in all of the lessons observed as the students appeared eager to participate by answering questions once prompted by the educator. One example of this participation was when the class was sorting out nitrogen's and carbons. A majority of the students appeared to be putting forward ideas and the educator was careful to ensure a wide range of students were able to participate.

##### **4.4.3.2 Students' Action Taking at School**

As the school's culture puts a lot of emphasis on zero waste messages, data that emerged from the teacher interviews regarding students' action taking around school cannot be contributed solely to the ZWE programme, as the school is also an active enviroschool. Therefore, action taking at school cannot be classified as evidence of action competence developing in the students solely as a result of the ZWE programme, as these behaviours are expected from them in school.

Brenda's interview offered insight into action that she has noticed students taking in response to the educator's work. One observation that she made was:

They aren't just [recycling] because they were told, but they see there's a purpose. All the messages that Renee gives the kids are totally supported by their practice. (Brenda, Interview)

This quote was also discussed in the knowledge development section (Section 4.4.1.5); it illustrates that the students are taking action based on zero waste messages, although this action is not directly related to the delivery of the compost unit. Another action-related account from Brenda further demonstrates student action that she has witnessed:

Yeah, kids take their own ideas about how they can recycle, so for example, the green bins in the classroom, kids will make up their own little pads instead of buying post-its, we don't buy those. All around the school you will see little pads, as part of the whole recycling thing. (Brenda, Interview)

While this again does not explicitly come from the composting unit, it is further evidence of students making changes in their daily activities by understanding zero waste messages.

#### 4.4.3.3 Students' Self-driven Action Taking

In this section, evidence of students developing action taking skills, action competence, as well as taking action at home is reported on.

In regard to developing the action taking skills in students, the main activity during the observations that was aimed at action taking was the construction of the compost bins in the third lesson. The educator told the students in the very first lesson that they would be making a compost bin, as the lesson plans specify. Therefore in regards to the action competence approach as identified in the literature, this action taking initiative theoretically does not develop action competence in the students as they were not responsible for choosing the action to take (Jensen & Schnack, 1997). However, the action was targeted towards helping to solve the problem of disposing of organic waste without using the landfill, which is the other criterion for action competence development in the literature.

Interview data did provide some evidence that students were empowered to choose their own actions in a way that contributed to the action outcomes of the unit. A specific theme regarding action taking development on the students' own accord around composting came from Renee's interview. One example of action arose when Renee was discussing students' overall attitudes towards the ZWE programme where she stated:

[Students learn] to turn their organic waste into fertilizer, some even start their own veggie gardens [giving them] sustainability and skills for life. They also feel empowered. (Renee, Interview)

As well as this action taking that Renee has reported on she also learned of students' action taking plans for home:

Some [students] will go home; they've said they already have compost at home. Some say they want to make their compost bigger so that they get more worms and can make some money. Some want information on how to build a bigger one and I bring them in plans for that. So I'll bring the resources as I said to teach them to do it at home. I give them plans for the layered ice-cream container worm farms, as it costs no money and they can do this themselves. I copy that for them just so they can do that. (Renee, Interview)

Therefore, there is evidence from the interviews to suggest that students are taking some of these ideas home.

The students' action taking initiatives were further explored in the focus group. In the focus group, students were asked in what ways they felt they could tell other people about the importance of composting. This question sought to address the question of whether or not the students could come up with ideas that can help solve the issue. The students' responses were limited, and their ideas were rather succinct. Their ideas included "[make] posters" "[tell people through the] Web" "Go around telling people", and "Text people" (Focus group). These responses do not indicate whether or not students would actually feel compelled to take any action after the ZWE programme, therefore these findings from the focus group are inconclusive.

The parent questionnaires asked parents one question around what practices have changed at home since the child went through the ZWE programme and how much of a change occurred (see Table 4.6), in order to explore whether the students took action on their own accord. The findings indicate that a majority of those students whose parents returned a questionnaire took some sort of action at home, however, what those actions were are harder to identify as there were fewer responses.

Table 4.6

*Parents responses with regard to household practices that have changed*

Question8	Since your child has gone through the ZWE programme, have any of your household waste practices changed? If so, please comment on how they have changed.			
Response	Not at all	Not much	A little bit	A lot
Total	3	2	7	2
Responses				

These changes were elaborated on in the responses to Question8b, where parents commented that “[Child] started a new worm farm, sorting food scraps” (Parent questionnaire, 2), “Setting up a compost bin. Being more mindful of unnecessary packaging at the supermarket” (Parent Questionnaire, 14 & 63), “More proactive with our recycling” (Parent questionnaire, 50), and “Food scraps going into worm farm” (Parent questionnaire, 47). This is evidence that students do take action at home, however this is a very small sample size and no definite claims can be made.

#### 4.4.3.4 Action/Participation Summary

To summarise, there was some evidence of the development of student action taking and participation skills in this case study. The observations did not indicate that action competence was being most effectively developed in students going through the ZWE programme as the action taking task was already predetermined by the programme; however, this was not the only source of evidence for action competence that was identified. Students have been known to take action at school as Brenda and Renee mentioned, as this is part of the whole school culture the school is trying to create. This came from evidence that students are thinking more carefully about waste in a self-initiated way. Students taking action on their own was also evident in five of the parent questionnaires where action was taken at home. There was therefore an apparent connection between ZWE and students taking action, and students did appear to be thinking about ways to minimise waste on their own. As well as action taking showing through in the data, there was an observable level of intergenerational transfer occurring.

#### **4.4.4 Intergenerational Transfer**

Intergenerational transfer is one of the main goals of the ZWE programme and also shows through heavily in the literature in regard to waste education. This theme is made very explicit in the ZWE lesson planning document, where it is stated for the very first lesson the educator is to:

Stress to the children that by the end of the course they will know more about composting than anyone else in their family. They will be the experts. You will teach them and they will become the teacher. (Zero Waste Education, 2013a)

Therefore, when collecting data, this theme was a major part of the instruments. The instruments that aimed to explore the intergenerational theme were the observations, interviews, student questionnaires, and parent questionnaires. The key findings indicate that there is a significant level of information taken home to parents, and there have been changes in some household practices. This is explored further below.

In the four observations, there were two specific instances where the educator mentioned sending messages home. In the first lesson, the educator stated “Compost is exciting! You will show your whole family how to compost.”(Observation 1, date). This was during the introduction of the lesson therefore there was no observable reaction from the students. Then in the final lesson the educator again mentioned taking messages home when she stated “Teach your family everything because you are the master composters!”(Observation 4, date). These remarks were just the starting point for the students, it was clearly important to see what was actually happening from these instances.

The impact of this theme that ZWE emphasises in their lessons showed through in the interviews with the classroom teachers. During the teacher interviews the teachers were asked if they saw any evidence of their students taking their learning in the ZWE programme home. Brenda recounted:

Oh they often do. We have families who now have recycling at home and they have their separations because the kids say this is what they do. (Brenda, Interview)

This was further exemplified by Kate when she stated:

Yeah, definitely, they took home [learning from the last ZWE unit] and had really good conversations at home and brought back heaps of feedback about what they do at home, [and] what they want to do at home to change things. (Kate, Interview).

During Julia's interview this theme was raised in the question about how ZWE fits into an enviroschool where she stated:

The message does get home, we get feedback about the message going home but whether it is enforced, we don't know (Julia, Interview)

This quote illustrates the challenge of determining intergenerational transfer. Julia acknowledges that the messages are discussed but without going into the homes of students it is very hard to measure. Therefore the questions on the student and parent questionnaires regarding intergenerational transfer were important to further gain insight into the intergenerational transfer.

On the student questionnaires, the first of these was Question9 in both the pre and post questionnaire which asked if the students intended to go home and help make a compost bin with their families. This question was partially flawed, as in the pre questionnaire the students were asked this and three of the 25 indicated no, however, in the post questionnaire these same students indicated that their families already had one. I saw this confusion as a reliability issue and understand that this question could have been confusing. However, the findings also showed that eight of the 25 students who did not indicate that they had a compost bin in the post questionnaire circled the option that they do intend to make a compost bin with their families, and five students indicated that they might. From these numbers it can be seen that at least thirteen of the students involved that did not have a compost bin had intentions of some sort to go home and make one.

The second question based around intergenerational transfer (Question11) in the post questionnaire asked if the students had discussed anything at home about their learning over the week. All of the students but one indicated that they had taken information home, and based on the questionnaire question analysis (see appendix M) were given a score based on how in-depth the response that was supplied in Question12 was in relation to what the students had reported they had been learning. Based on the scoring system, out of the 25 students, ten students were scored as giving sophisticated responses (e.g. "That [the class was] making worm farms and about leachate and methane [gas] from the landfill") and fourteen students were scored as giving less sophisticated responses (e.g. "how many babies in a [worm] egg"), indicating that 24 of the students discussed their learning at home in some way. This data shows some agreement with the parent questionnaire data as shown below in Table 4.7, where all



parents that returned a questionnaire reported some level of learning that was taken home and shared.

From Question12 in the post questionnaire the ideas that students reported taking home were that they built a worm farm in class (7 students), that methane and leachate are produced in landfill (5 students), that compost is important and indicating what items that can be put in compost (3 students), and simple worm facts (4 students). These reports represent a range of ideas covered by the ZWE programme. It was important to triangulate this data with the parent questionnaires.

As the notion of intergenerational transfer concerns parents in a major way, it was clear that the parent questionnaire needed to investigate this. Six of the total eight questions were geared towards exploring what the child had taken home and what impact this may have had. These questions were Question1, 3, 4, 5, 6, and 8 in the questionnaire (see appendix H). Questions 1, 3, 5, and 8 were responses that simply needed to be circled, whereas questions 4 and 6 were open ended. The findings of the circled responses can be seen below in Table 4.7.

Table 4.7

*Analysis of closed questions regarding intergenerational transfer*

Question	Not at all	Not much	A little bit	A lot
1. Child shared much?	0	1	7	5
3. Mentioned ideas?	0	2	7	4
5. Talk about reducing rubbish?	2	3	7	1
8. Any practices changed?	3	2	6	1

From this table it can be seen that for Question1, a majority of returned parent questionnaires indicated that the students did take learning home. From Question3 the same trend was found indicating the ideas or points of interest were included on what students brought home.

Responses to Question5 indicate that while messages were taken home as responses to Questions 1 and 3 demonstrate, five of the students did not talk much or at all about how their

household could reduce rubbish. This triangulates with the data from the student questionnaires in which students were asked what they told their parents about. From those findings, only three students indicated that they took home information about the importance of compost and specific items that can or cannot go in, while 7 students told their parents they were making a compost bin in class. The message of using composting as a way to reduce rubbish was therefore not strongly evident in either what the students actually mentioned at home, or from what was recalled by parents in the questionnaire.

Responses to Question8 indicate that intergenerational transfer varies from house to house. Seven of the responses indicated that a little or a lot has changed, which shows that some students are taking messages home that are leading to action.

There were three opportunities for parents to comment on the parent questionnaire form on what had been discussed and what had changed at their households, and the responses were put into themes and given a tally for the number of times the themes emerged, as seen below in Table 4.8. It must be noted that the response rate for these open questions was low on the already low response rate of the parent questionnaires, so this data is indicative only. The most common response was 'worm farm' or 'how to make a worm farm' or close variations which were grouped together. This data agrees with what the students were indicating they discussed at home.

Table 4.8  
*Themes regarding ideas shared at home*

Theme	Number of occurrences
How to make worm farm/ "worm farm"	10
Worm Facts	3
Classification of carbons and nitrogen's/What can go in	3
Started a worm farm	3
Requested we make a worm farm	2
Methane/Leachate/What happens in landfill	1
Feeder roots	1
No waste in lunch	1
Reusing plastic bags	1

To summarise, findings indicate that intergenerational transfer was reported by all students in the questionnaires. This emerged from the data from interviews, observations, questionnaires and the parent questionnaires. While no major claims can be made about these findings due mainly to small sample sizes, some specific examples were provided of intergenerational transfer. Furthermore, the findings further indicate that messages being taken home from the ZWE programme have led to changes in a few households waste management practices.

#### **4.5 Chapter Summary**

This chapter has reported the findings of the data collection. This was done by first determining the goals of the ZWE programme and establishing the context of the school. The outcomes of the ZWE programme were then analysed and reported.

The goals of the ZWE programme can be summarised by noting that the ZWE programme has the goal of achieving intergenerational transfer through the ZWE programme, with the goal that the ZWE programme is relevant to the age of the student and that it is congruent with the New Zealand Curriculum document. The ZWE programme also has the goal of having a team of independent educators that are supplied with appropriate teaching resources and timetabling procedures.

The goals for the teachers can be summarised by saying that they wanted the ZWE programme to fit with the school culture, as well as providing the students with an awareness of the issues that we are faced with in regards to waste management that will enable them to put the information to use to take action, particularly at home. It was found that for this school, the ZWE programme fits well with the culture they are trying to achieve and that the goals of the teachers and the programme were congruent.

The knowledge development of the students was observable throughout the learning for the week. The students developed their knowledge around making good compost and what to do with it, as well as learning a lot of new information about worms. Teachers have noticed changes in students through the ZWE programme, and specifically changes in their knowledge of waste and recycling.

The attitudes and awareness section was broken into attitudes towards the issue and attitudes towards the ZWE programme, and awareness of waste practices. Key findings that emerged from this data indicated that students were highly engaged with the composting unit and appeared to use their learning to inform their practices at school, and more than half of the

parent questionnaires returned indicated that they noticed a change in their child's attitude towards waste after the programme. The key findings of the students' attitudes towards the ZWE programme indicate that the students were very engaged with the ZWE programme and felt very positively towards it, and that the varied types of learning in the unit kept all students engaged. The findings of the awareness of waste practices indicate that the students became more aware of what happens at home through the ZWE programme.

The development of action taking and participation skills did not show through clearly in this case study. The observations did not indicate that action competence was being most effectively developed in students going through the ZWE programme, as related to the criteria for action competence (Jensen & Schnack, 1997). However, the student-driven action, as Brenda and Renee mentioned some students taking is evidence for action competence, as are the action ideas that emerged in five of the parent questionnaires where action was taken at home. Therefore in discussing action competence, these other sources of evidence of student action must be taken into consideration as action taking skills that have developed in students.

The findings from investigating the intergenerational transfer outcomes shows that it did occur in this case study. Table 4.8 displays evidence of the intergenerational transfer that occurred. The findings also indicate that messages being taken home from the ZWE programme have made changes in a few households' waste management practices.

The next chapter discusses these findings and draws conclusions with suggestions for the ZWE programme of ways to best implement waste education messages.



## **Chapter 5 Discussion**

### **5.1 Overview of Chapter**

This chapter discusses the findings of this research. The chapter begins with a discussion linking the research questions and findings of the study with the literature. Following this discussion is a reflection on the limitations of the study. Finally, recommendations for the programme are made.

### **5.2 Discussion of Findings**

The research questions in this study relate to: how the intended aims/goals of the Zero Waste Education (ZWE) programme align with those of environmental education (EE); and how the outcomes of the ZWE programme support the goals of environmental education. This section discusses these research questions in relation to the findings of the study.

#### **5.2.1 Aims/Goals of ZWE and EE**

To discuss the alignment between the goals of the ZWE programme with those of EE, it is important to define where the goals for EE have been derived from.

From Chapter 2 (section 2.2.1) the goals of EE as stated in The Tbilisi Declaration (UNESCO, 1978), the *Guidelines for Environmental Education in New Zealand Schools* (Ministry of Education, 1999), as well as *See Change* (Parliamentary Commissioner for the Environment, 2004) have indicated a consistent approach to EE in New Zealand. These goals of EE can be summarised into five main points. EE should aim to develop an awareness and sensitivity towards environmental issues, and develop students' understanding and knowledge of human impact on the environment. Additionally, educators should aim to foster attitudes and values that support students in developing feelings of concern for environmental issues, and further develop skills to investigate and help solve the issues. Finally, the aim is for students to use these abilities to participate and take action towards addressing the issues.

The stated aims of the ZWE programme are related to running the programme, as well as broad goals dealing with development of the programme. ZWE aims to develop a programme that educates the student and their families, and the programme needs to be able to be incorporated into the New Zealand teaching curriculum (Personal communication, Bruce Trask, June 27<sup>th</sup> 2013). ZWE also aims to assist in their funding bodies' needs to meet their requirements in the Waste Minimisation Act 2008 that states that educational activities are effective methods for achieving successful waste management and minimisation outcomes (Ministry for the

Environment, 2008). Finally, the aims that relate to running the programme are that ZWE needs to “build a team of dynamic educators capable of working independently” (Personal communication, Bruce Trask, June 27<sup>th</sup> 2013).

The goals have an uncertain alignment as they are dealing with different ideas. However, there are connections that can be made with the goals of the ZWE programme and the aims from the literature.

The aim of the ZWE programme to educate students and their families shows a close alignment to one of the fundamental aims of EE explored in this study, that of raising awareness and sensitivity. A raised awareness is considered an important aim as it is one part in the holistic approach that the five aims encapsulate. Awareness about and for the environment is fostered through the personal commitment and actions of the learner (Ministry of Education, 1999). The relationship between awareness and sensitivity and the aim of ZWE of intergenerational transfer is evident as part of the action and commitment of the learner in discussing things at home with their family.

Again with the second aim of EE, knowledge and understanding, there is a close alignment between the goal of ZWE to educate students and their families as well as the goal to develop a programme that can be incorporated into the curriculum. The differences are acceptable in this context as the goals of ZWE signal knowledge development around the issue of waste, which enables students to take messages home to their families, as well as fitting nicely into the curriculum. The curriculum document indicates that learners need to develop a future focus that encourages students to explore sustainability and ecological sustainability has also been identified as one of the values to be encouraged.

The same can be said about the third and fourth aims of EE, attitudes, values, and skills. There is a moderate alignment between this aim of EE and the goal of ZWE to educate students and their families as well as to develop a programme that can be incorporated into the curriculum. The aims and goals align in this context, as skill and attitudinal development are supported by the curriculum document’s values section, where it is stated that students need to develop their own values and make decisions about these values and act on them (Ministry of Education, 2007).

Finally, the sense of responsibility related to participation and action can be said to be incorporated in ZWE's first goal, as by educating their families, students are taking a form of action. There is an alignment between these as intergenerational transfer assists students to "develop environmental citizenship competencies which include informing and influencing the actions of others" (Ballantyne, Fien, & Packer, 2001, p. 1). It is the goal of ZWE to encourage this influencing of actions of others, and by enabling students to create a worm farm to go home, this transfer can begin to occur.

Overall, there is an uncertain alignment that can be drawn between the goals of ZWE and the aims of EE as identified in the literature. While the aims from the literature and the goals from the ZWE programme appear concerned with different aspects, there are connections that can be made between knowledge developments in both. These differences are clear in the context, however the recommendation from these differences is for ZWE to consider more carefully what they intend in their goals.

### **5.2.2 Outcomes of the ZWE Programme**

The second research question was concerned with identifying outcomes of the ZWE programme and determining how these outcomes aligned with the goals of EE. To determine the outcomes of the ZWE programme for the evaluation, the evaluation questions were developed which guided the development of the research instruments for data collection to determine the outcomes. These outcomes are now discussed in relation to the goals of EE.

#### **5.2.2.1 Knowledge Outcomes**

The knowledge outcomes of the programme relate to the second aim of EE "knowledge and understanding of the environment" as specified in the *Guidelines* (Ministry of Education, 1999, p. 9). This knowledge aspect relates to the need for the "about" in the "in, for, and about" formula that aims to produce a knowledgeable individual (Barker & Rogers, 2004). Knowledge development has been indicated as important in EE and "critical" if students are to meet the other aims of EE (Ministry of Education, 1999, p. 14). There was mention of knowledge development in the ZWE programme goals where it is specified that the intent is for students to gain the knowledge that will help them educate their families more about waste minimisation and water. Findings from the case study indicated that students were more knowledgeable of what compost is, what it can be used for, what can be composted, and implications of sending food scraps to landfill, as well as the importance of worms in compost after going through the ZWE programme (see Section 4.4.1). Based on the apparent raise in knowledge around



composting and its importance in the questionnaire data and from teacher interviews, it would appear that the ZWE programme is meeting the aim of EE around knowledge development.

In the literature a number of pedagogical techniques to develop students' knowledge were identified. These were harnessing students' curiosity, giving students opportunity to take responsibility, experiential learning, collaborative and participatory approaches, exploration of prior understanding, and opportunities to discuss views and challenging of student views (Cotton, 2006; Jenkins, 2009). There was evidence in the observational data that the ZWE programme did appear to use each of these pedagogical techniques (see Section 4.4.1.2), but there was less evidence during data collection of discussing and challenging student views in the lesson planning. This did happen in one instance when asking students with items that can be composted; however, no explicit discussion of students' views in relation to the importance of composting and waste minimisation was seen in the class that was observed.

#### 5.2.2.2 Attitude/Awareness Outcomes

The attitude and awareness outcomes are in relation to the first aim "awareness and sensitivity to the environment and related issues" again as specified in the *Guidelines* (Ministry of Education, 1999). There was no specific mention of goals around attitudes and awareness in the ZWE programme goals. This attitude and awareness aspect, like the knowledge outcome, relates to the need for the "about" in the "in, for, and about" formula that aims to construct a modified worldview in which students begin to care more deeply about the issue (Barker & Rogers, 2004).

Findings indicated that students may have developed ideas that relate to the importance of composting (see Table 4.2 and 4.4) and students appear to have become more aware of household waste practices after going through the ZWE programme (see Section 4.4.2.3). Therefore, the ZWE programme would appear to be meeting this goal of EE as by developing perceptions towards the importance of composting and becoming more aware of how their household deals with waste, it would appear that the students have demonstrated attitudes and awareness to the issue of the growing waste problem as they have noticed what happens at home and the effects of the issue.

The development of awareness was not specified in the goals of ZWE, however, still happened in the delivery of the unit. This could possibly come down to the passion and experience of the ZWE educator, or the nature of the unit itself. However, it is recommended that all ZWE educators are made aware that this awareness development is one of the goals for a

programme like ZWE delivering EE messages in order to ensure that this is happening across the whole programme.

#### 5.2.2.3 Action/Participation Outcomes

The action and participation outcomes directly relate to the fifth aim of EE as specified in the *Guidelines* that state students should develop a sense of responsibility through action and participation (Ministry of Education, 1999). The ZWE goals currently make no specific mention of action and participation outcomes. This aspect relates to the “for” aspect in the “in, about, and for” formula. The literature states that to apply the ‘for’ aspect, students should be engaged in experiential learning and the development of action competence should be present (Barker & Rogers, 2004; Quay, 2005).

While no data was collected regarding experiential learning, the practice of using experiences did happen in the lessons where students went outside of the classroom to discover first-hand the schools compost as well as the educators’ compost from home (see Section 4.4.1.1). Furthermore, as discussed in Chapter 4 (see Section 4.4.3.4), students provided evidence of action taking, although there is some doubt as to whether it was truly action due to not being initiated by students. According to Jensen & Schnack (1997), the action that the programme takes should be initiated by the students, whereas in the ZWE programme the action was predetermined. However, the findings indicated that students were capable of taking action after the programme as indicated by the teacher interviews, parent questionnaires, and student questionnaires.

Therefore, ZWE did appear to be meeting the action and participation aim of EE, although there is a limit to their development of the action competence model that is described by Jensen & Schnack (1997) as developing courage, commitment, and desire to get involved in the issue. The literature suggests that as the students may not have felt empowered to take actions themselves as they appeared not be involved in the decision about what action to take, it is possible that the actions taken to build a worm farm and educate the parents may not be robust and long lasting in the students. This is only speculative, but the literature suggests that there is the possibility that long lasting action competence has not been developed.

#### 5.2.2.4 Intergenerational Transfer

Finally, the intergenerational transfer outcome of the programme relates directly to both the goals of the ZWE programme and those of EE (see Section 2.2.2.5) (Ballantyne, Fien, & Packer, 2001; Grodzińska-Jurczak, Bartosiewicz, Twardowska, & Ballantyne, 2003). Intergenerational

transfer has been identified as an important outcome in waste education specifically, as it is a means of assisting positive environmental messages to get home and into the community (Ballantyne et al., 2001). The literature indicates that an effective way of getting messages home to parents is involving them in helping students with homework activities, assignments requiring research, and presenting in class (Ballantyne et al., 2001). The ZWE programme does appear to effectively do this, as findings indicated that students were taking messages home. This idea of taking the message home was urged in the lesson planning documents and was observed from the educator in the lessons. Parents were required to help students to gather items for creating the compost bin, as well as helping them on their homework sheets. Moreover, from the parent questionnaires returned, a majority of the questionnaires indicate that students did take messages home; therefore ZWE appeared successful in meeting this goal.

### **5.2.3 Conclusions**

Based on the research question addressing the alignment of the goals of both ZWE and EE as a whole, there appears to be an uncertain alignment of these goals. Although this alignment is uncertain, some conclusions have been drawn using literature that further relates the goals of ZWE and the aims of EE showing an alignment. The differences between the aims and goals are understandable in the context, however, the recommendation from these differences is for ZWE to consider more carefully what they intend in their goals. This would be both beneficial for stakeholders and the educators as more detailed goals would ensure that everybody is on the same page.

In addressing the second research question regarding the outcomes of EE and those of ZWE, it appears that the programme is successful in meeting their goals and those of EE as a whole. Knowledge development appeared to occur, although there was no explicit discussion of students' views in relation to the importance of composting as the literature specifies. Awareness did appear to be developed, however, it is recommended that ZWE includes awareness development as one of its specified goals. ZWE did appear to be meeting the action and participation goal of EE, although there is a limit to its development of the action competence model that is described by Jensen & Schnack (1997) as the literature suggests that there is the possibility that long lasting action competence has not been developed. Finally, regarding intergenerational transfer, from the parent questionnaires returned, a majority of the questionnaires indicated that students did take messages home; therefore, ZWE appeared successful in meeting this goal.

From the discussion of the aims of EE in relation to the goals of the ZWE programme, some limitations of the evaluation study and recommendations to the programme can be discussed.

### **5.2.3 Limitations of the Study**

The most obvious limitation to the evaluation study carried out is the limited scope of the study. As this study was to satisfy the requirements of a Master's degree, it is apparent that the limited time frame of the study will have had an effect on the level of depth that the study could go in to. In planning the study it became apparent that there was only enough time to carry out a case study in one school on one unit that the ZWE programme offers. It is therefore hard to project these findings out to the entire programme and all of the units; however, the case study does offer some direction to carry out further evaluations on other units.

Another limitation to the study was the school chosen. This school was a rather small school in a country school setting. Students and their families of this school may not be representative of students and families of larger, more urban schools, or even of smaller country schools in different areas of the country. This limitation needs to be kept in mind again when dealing with schools that are not enviroschools. It was apparent in the data collection that the school was trying to create a culture that fosters sustainability ideas in which waste education played a part. Some teachers indicated that they had discussed with students in the past ideas around waste minimisation and composting, even if in a small way this could have had an effect on the study.

Finally, a limitation to the study that came down to inexperience of the researcher was the focus group. It was apparent in the findings of the study that the focus group carried out was rather limited. The students were not very willing to discuss their feelings or ideas, as they seemed very reserved until the focus group was coming to an end. In further research endeavours, I will attempt to consult the literature in more depth around getting the most from a focus group with younger students.

### **5.2.4 Recommendations for the ZWE Programme**

On the basis of the findings of this study, the following recommendations can be made.

The first recommendation to the ZWE programme is undertake planning with staff to formally agree on goals and ensure that these goals are more explicitly aligned to the aims of EE and are embedded in planning documents to guarantee that all educators are aware of them. The goals supplied by the ZWE programme did not explicitly address what EE theory states as aims of an

environmental education programme, even though the programme did appear to be meeting each of these goals, as well as the aims of EE to some degree.

Another recommendation to the ZWE programme is to further develop the action taking in the lessons to fit more with the action competence model as suggested by Jensen & Schnack (1997). Action taking skills were being developed in the composting unit, however to align more with the literature it is beneficial to enable the students to participate in decision making in action taking ideas that will target the problem. A suggestion is to brainstorm with the students about ways that they know the issue of food scraps that are compostable going to landfill can be addressed. Scaffolding can be done with the students to help bring them to the realisation that their individual households can make a difference by diverting their food scraps by making a worm farm. Children may then feel that the worm farm was their idea and feel empowered to make this change. This could possibly ensure long lasting action competence as the children can reflect on a time that they were able to make a positive change for the environment.

Correspondingly, it was observed in the data collection that there was a lack of discussing and challenging student views. That literature states that discussing students' prior views around an issue and then challenging these has more of an impact on the knowledge and attitudinal development of the learner (Jenkins, 2009). One way in which this idea can be incorporated into the composting unit is by asking students about their views on compost. Some students may have no idea what it is or think it is smelly, while others with more experience with compost may say that it is beneficial for gardens. Throughout the compost unit, as students are exposed to the idea that compost is beneficial and is quite interesting, may reflect on their initial statements regarding compost and realise their position has changed. By coming to their own conclusions they may take more from the messages.

In addition to challenging student views, more development could be done to further enable intergenerational transfer to occur. One way to get the message home is by involving parents in homework tasks, assignments requiring research, and in class presentations (Ballantyne et al., 2001). Another way to ensure intergenerational transfer occurs is to engage the students emotionally by showing students the evidence and effects of an environmental problem, and efforts involved to alleviate the issue (Ballantyne et al., 2001). One idea could be to have the students go home and look online with a parent for facts related to landfills in New Zealand and return the next day with one fact to deliver to the class. This could be followed by a short video appropriate for the age group outlining the effects that landfills have on our environment and the efforts involved in their maintenance.

Furthermore, during the data collection two recommendations for the ZWE programme came through in the interviews. Firstly, one of the teachers mentioned that it would be beneficial to her if the ZWE website had resources that teachers could use before or after the ZWE programme came into class. She suggested links to things that could be put up in the classroom, and links to relevant videos that she could show students when there was time. The ZWE programme does offer links to other websites and details where relevant articles in School Journals can be located, and this could be put on the website as well.

The second recommendation put forward in the data collection is to provide parents with more support when the worm farms go home. If there were pamphlets handed out to the students to take home with the compost bins then the programme would not have to rely solely on information being passed from student to parent, where some important details could be missed.



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# Appendices

## Appendix A: Aims of the Zero Waste Education Programme

This programme was created for Local Body Councils (Initially Tauranga City Council) throughout New Zealand to help them meet their requirements of the Waste Act. In doing this the programme is designed to use the students, at various levels in schools, to gain the knowledge that will help them educate their families more about waste minimisation and water.

**Aim: A dynamic and comprehensive waste education programme that suits the needs of the end user**

### Related Objectives:

- Continue to develop content that educates both the student and their families.
- Continue to develop a programme that can be incorporated into a teaching curriculum.
- Continue to meet councils' specific needs in terms of meeting their requirements of the Waste Act.
- Continue to develop wide-ranging yet specific units of content to suit different age groups.
- Continue to change with the shifting trends in the waste industry.
- Continue to develop a model that can be taken to all geographical areas of New Zealand society.
- Develop a more "interactive website" over the next twelve months to encourage more users.

**Aim: Financial sustainability**

### Related objectives:

1. Maintain existing contracts:
  - Report as contractually required to existing council customers.
  - Meet voluntarily in-person with all existing council customers depending on frequency of contract renewal.
2. Expand into new districts:
  - Maintain a continual database of potential customers.
  - Meet voluntarily in-person with all potential council customers depending on frequency of contract renewal.
  - Have a promotional presence at annual occasions where multiple potential customers are in attendance (e.g. Wasteminz, EE biannual conference).

**Aim: Build a team of dynamic educators capable of working independently**

### Related objectives:

- Have a generic timetabling process for educators to follow.
- Provide educators with generic teaching resources that are updated as required.



## Appendix B: Theoretical Aims of Environmental Education

### Theoretical principles

- **5 aims of Tbilisi** (which the following aims will fit in to)
- **In-** harness curiosity of students, give students opportunities to question and take responsibility in their learning; experiential
- **About** – offer students a participatory approach, explore prior understanding, discuss views, challenge views ; teach all sides of an issue
- **For** – experiential; develop action competence of students
- **Whole school approach** – is this happening in schools?
- **Intergenerational transfer** – is there a transfer of knowledge from student to parent?

## Appendix C: Theoretical Evaluation Framework

Outcomes	Evaluation Questions	Performance Indicators	Performance information	Making judgements about success
<b>Ultimate outcome</b> - reduce the amount of waste in landfills and use resources in a sustainable way	Does the ZWE programme enable students with the action taking skills needed to deal with their waste in a sustainable way?	Review data on waste to landfill annually.	Site reports	Comparisons of waste to landfill and water usage with councils of similar size that do not have the ZWE programme
<b>Intermediate outcome</b> - change in community waste management behaviour towards more sustainable practices	Are the messages of the ZWE programme being taken home to parents? If so, are there any changes in household waste practices?	Data from participating households	Questionnaires (student, parent)	Is there a change?
<b>Immediate outcome</b> - raised awareness and knowledge of students and parents of day to day activities that affect waste management	Is the delivery of the ZWE programme effective and relevant to current waste education theory? Do students have a raised awareness of waste and resource management after going through the ZWE programme?	Comparison of the theoretical ideas that should be apparent in the programme vs what the programme does. Comparison of waste and resource management knowledge before and after the programme.	Pre/post questionnaires	Does the programme use the theoretical ideas of effective environmental education? Do the students have more knowledge about waste/resources after the programme?
<b>Activities</b> - lessons	Do the lessons reflect effective environmental educational practice?	Manual review of lessons	Review	Standards will be the theoretical aims of EE
<b>Needs</b> - Increase in sustainable household waste practices.	Are the messages of the ZWE programme being taken home to parents? If so, are there any changes in household waste practices?	Data from participating households	Questionnaires	Is there a change?

## Appendix D: Caretaker Interview

How long have you been a caretaker at this school? And before that?

What sort of waste management practices does your school have in place?

☐ Staff room recycling ☐ Chickens

☐ Staff paper recycling ☐ classroom Paper recycling ☐ Worm farm

☐ Organics bin ☐ classroom recycling ☐ Other \_\_\_\_\_

Which of those waste management practices that you are not doing would you like to see in place in your school?

What are the barriers to having those practices that your school does not have in place?

Have any waste management practices changed in the school recently? How recently?

Are you aware of the Zero Waste Education programme that comes into your school?

If yes, how did you become aware of them? Head teacher? Talking to educator? Students?

If yes, what is your opinion about ZWE and their educator?

Have you ever been contacted by staff, students, or parents with concerns about waste management in the school?

## Appendix E: Head Teacher Interview

Can you tell me how long you have been teaching at this school? And before that?

What sort of waste management practices does your school have in place?

- ☐ Staff room recycling ☐ Chickens
- ☐ Staff paper recycling ☐ classroom Paper recycling ☐ Worm farm
- ☐ Organics bin ☐ classroom recycling ☐ Other\_\_\_\_\_

Which of those waste management practices that you are not doing would you like to see in place in your school?

What are the barriers to having those practices that your school does not have in place?

Have you ever been contacted by students or parents regarding waste management practices in the school?

How long has your school been an enviroschool? How do you think that the Zero Waste programme fits into an enviroschool?

Why does your school work with ZWE? How long has this happened?

What is your impression of the organisation of the ZWE programme? Have they provided enough information, resources to you, in a timely way?

What are your impressions of the ZWE programme delivered in the school this week?

What are you hoping your students would take away from going through the programme?

What sorts of changes, if any, have you observed in students after they have gone through the ZWE programme? Can you give examples? When? Specifics, need to dig deep. Specifically any of these?

☐waste action      ☐waste knowledge      ☐waste attitudes

Have any practices changed with the school since Zero Waste began coming in to teach at this school?

- If yes, what sort of changes?
- If no, have any staff/students/teachers/parents contacted you with concerns to change any practices within the school?

## **Appendix F: Classroom Teacher Interview**

Can you tell me how long you have been teaching at this school? And before that?

What is your impression of the organisation of the ZWE programme? Have they provided enough information, resources to you, in a timely way?

Did you see any barriers to implementing the unit that ZWE has provided your syndicate/team?

Can you describe how you prepared your class for the ZWE programme coming to your classroom?

Did you do any teaching around compost before the programme came in?

What were your impressions of the ZWE programme delivered to your class?

What were your impressions of the ZWE educator, and their delivery of the programme?

How well do you feel the ZWE lessons fitted with the New Zealand Curriculum?

What are you hoping your students would take away from going through the programme?

What sorts of changes, if any, have you observed in students after they have gone through the ZWE programme? Can you give examples? When? Specifics, need to dig deep. Specifically any of these?

☐waste action      ☐waste knowledge      ☐waste attitudes

Did you see evidence of students taking their learning home? When/How

Do you have any plans to continue developing your students' knowledge around waste education/composting after the ZWE visit?

Do you have any recommendations for the programme?

## Appendix G: Educator Interview

Can you tell me how long have you been working as a ZWE educator? And before that?

How many times have you delivered this unit?

What do you feel are the strengths of the ZWE programme?

Are there areas that you feel the ZWE programme could improve on?

How do you feel about this composting unit?

Can you describe the process of engaging with the school? How did it go? –prompt when/how did they give planning before they went into school

What were your experiences of working with this school?

What is your experience working with a school that is an enviroschool? Do you notice differences?

What are your impressions of the waste management practices at this school?

Who have you worked with on the staff to deliver the ZWE programme (head teacher, class teachers, caretaker)? How has that been?

How do you feel the lessons went with the classes?

How did you find the levels of student engagement with the teaching resources and lessons that you are provided with?

What sorts of changes, if any, did you see in students throughout the length of the programme? Can you give examples? When? Specifics, need to dig deep. Specifically any of these?

☐waste action      ☐waste knowledge      ☐waste attitudes

## Appendix H: Pre Questionnaire

Please answer to the best of your ability. I will read the questions and the options out for you.  
Please raise your hand if I am going too quickly.

1. What is composting? Circle the best answer

- A. A way of getting rid of food scraps.
- B. I have no idea.
- C. Recycling food scraps into garden nutrients.
- D. Disposing of food scraps in a bin to get broken down.

2. Please circle the items that can be composted. If you aren't sure, just move on.

- |                       |                 |
|-----------------------|-----------------|
| Wet Grass Clippings   | Plastic Bottles |
| Cardboard             | Egg Shells      |
| Rubber bands          | Banana Peels    |
| Coffee Grounds        | Plastic Wrap    |
| Dried Grass Clippings | Tin cans        |

3. How do you dispose of your food scraps at home? Circle all that apply.

- A. Put them in the rubbish bin
- B. Put them in the compost bin
- C. Put them in the worm farm
- D. Give them to the chickens
- E. Other: \_\_\_\_\_

4. Rubbish that is collected from your house gets put in the ground in a landfill. What do you think happens to food scraps in a landfill? Please circle all that apply.

- A. Nothing, it stays the same
- B. It produces leachate
- C. Worms eat it
- D. It produces methane gas

5. What could you use finished compost for? Please circle all that apply.

- A. Use it as mulch



B. Dig it into the garden

C. Put it in the rubbish

D. Put it around tree drip lines

6. How comfortable do you think you would be showing your parents how to make good compost? Please circle your answer.

A. I wouldn't know how to

B. Yes I could maybe try

C. No problem, it would be easy!

7. How important do you think composting is? Please circle your answer.

A. Not at all important

B. A little bit important

C. Very important

8. Can you explain why you feel this way?

Circle which option you agree with the most.

9. I intend to go home and help make a compost bin with my family.

☐ NO

☐ Maybe

☐ YES

☐ We have one already

10. I feel that everyone should compost their food scraps.

☐ NO

☐ Maybe

☐ YES

## Appendix I : Post Questionnaire

Please answer to the best of your ability. I will read the questions and the options out for you.  
Please raise your hand if I am going too quickly.

1. What is composting? Circle the best answer

- A. A way of getting rid of food scraps.
- B. I have no idea.
- C. Recycling food scraps into garden nutrients.
- D. Disposing of food scraps in a bin to get broken down.

2. Please circle the items that can be composted. If you aren't sure, just move on.

- |                       |                 |
|-----------------------|-----------------|
| Wet Grass Clippings   | Plastic Bottles |
| Cardboard             | Egg Shells      |
| Rubber bands          | Banana Peels    |
| Coffee Grounds        | Plastic Wrap    |
| Dried Grass Clippings | Tin cans        |

3. How do you dispose of your food scraps at home? Circle all that apply.

- A. Put them in the rubbish bin
- B. Put them in the compost bin
- C. Put them in the worm farm
- D. Give them to the chickens
- E. Other: \_\_\_\_\_

4. Rubbish that is collected from your house gets put in the ground in a landfill. What do you think happens to food scraps in a landfill? Please circle all that apply.

- A. Nothing, it stays the same
- B. It produces leachate
- C. Worms eat it
- D. It produces methane gas

5. What could you use finished compost for? Please circle all that apply.

- A. Use it as mulch

B. Dig it into the garden

C. Put it in the rubbish

D. Put it around tree drip lines

6. How comfortable do you think you would be showing your parents how to make good compost? Please circle your answer.

A. I wouldn't know how to

B. Yes I could maybe try

C. No problem, it would be easy!

7. How important do you think composting is? Please circle your answer.

A. Not at all important

B. A little bit important

C. Very important

8. Can you explain why you feel this way?

Circle which option you agree with the most.

9. I intend to go home and help make a compost bin with my family.

☐ NO

☐ Maybe

☐ YES

☐ We have one already

10. I feel that everyone should compost their food scraps.

☐ NO

☐ Maybe

☐ YES

11. Have you discussed anything you have learned from going through the waste programme at home with your parents or caregivers?

☐ NO

☐ Yes a little

☐ Yes, a lot

12. If yes, what did you tell them about?

13. How much fun was the Zero Waste programme?

☐ Not at all fun

☐ A little bit fun

☐ A lot of fun

14. Did you enjoy the way that Renee taught you about composting?

☐ Not at all

☐ A little bit

☐ A lot

15. I liked / did not like how Renee taught us about composting because:

16. How did you feel about learning about composting?

- ☐ It was boring      ☐ It was okay      ☐ It was very interesting and fun

17. Overall, my knowledge of composting and waste has improved during this programme.

- ☐ No I haven't learned anything      ☐ I didn't learn much      ☐ YES, I learned a lot

## Appendix J: Parent Questionnaire

1. How much has your child shared with you about their learning in the Zero Waste Education programme at school?

☐ Nothing at all      ☐ Not much      ☐ A little bit      ☐ A lot

2. Has that surprised you at all?

3. Has your child mentioned any ideas or points of interest that they have learned in the Zero Waste Education programme?

☐ Not at all      ☐ Not much      ☐ A little bit      ☐ A lot

4. If yes, what did your child discuss with you?

5. Did your child talk to you about ways to reduce the amount of rubbish that your household produces?

☐ Not at all      ☐ Not much      ☐ A little bit      ☐ A lot

6. If yes, what did they say?

7. Have you noticed any change in your child's interest or awareness around responsible waste practices at home e.g. disposal/reduction since they have gone through the programme?

☐ Not at all      ☐ Not much      ☐ A little bit      ☐ A lot

Comment:

8. Since your child has gone through the Zero Waste Education programme, have any of your household waste practices changed? If so, please comment on how they have changed.

☐ Not at all      ☐ Not much      ☐ A little bit      ☐ A lot

Comment:

## Appendix K: Observation Sheets

Observation questions – to be answered following observations

Does the educator recap on last session?

Are students participating? How?

Are students engaged? How?

Students given opportunity to question/take responsibility? How?

What is the flow of the lesson? Does the educator start with knowledge and then move on to experience?

How did the teacher facilitate decisions about the action?

Evidence of intergenerational transfer/whole school/in about for? Specifics.

### Observation Sheet 1

Time	Teacher actions	Students actions

## Observation Sheet 2

Theoretical Principles In	Specifics	Examples
	Harness student curiosity	
	students given opportunity to question	
	students given opportunity to take responsibility	
	experiential	
Notes		
About		
	Collaborative/Participatory approach	
	Explore prior understanding	
	Discuss views	
	Challenge students views	
	Teach all sides to issue	
Notes		
For		
	Experiential	
	Action competence	

## **Appendix L: Focus Group**

Did you have fun in the Zero Waste Programme?

What sorts of things did you learn about?

Has the programme made you think differently about waste?

Why do people compost?

Is composting an important thing to try and do? Why?

In the questionnaire some students indicated that you cannot put aluminium cans or plastic bags in the compost bin. Why do you think that is?

How comfortable do you think you would be showing somebody how to make good compost?

In what ways do you feel you could tell other people about the importance of composting?

Did the Zero Waste teacher make the programme interesting and fun? How?

How much that you learned was new knowledge that you didn't have before going through the programme?



## Appendix M: Questionnaire Question Analysis

Knowledge			
Question 1: What is composting? Circle the best answer			
Response		Score	Justification and reference
A	A way of getting rid of food scraps	1	"In addition to yard wastes, many people compost kitchen wastes, such as vegetable scraps, coffee grounds and eggshells. " (Wilson, Feicht, 2013).
B	I have no idea	0	Student does not know.
C	Recycling food scraps into garden nutrients	3	"As vegetation falls to the ground, it slowly decays, providing minerals and nutrients needed for plants, animals, and microorganisms. " (Epa, 2013). From the ZWE lesson plans: "Compost is like new dirt. It's like super-vitamins that you can feed to your plants." (ZWE, 2012a, p.3).
D	Disposing of food scraps in a bin to get broken down.	2	"Backyard or onsite composting is suitable for converting yard trimmings and food scraps into compost that can be applied on site." (Epa, 2013). From ZWE lesson plan: "You are trying to make them see that there are lots of different designs, some made of plastic, wood, or just a pile on the ground" (ZWE, 2012 a, p.3). This is taught before the quote for option 'c'.
Use of data:		Determine if composting knowledge has raised	
How to display data:		Display as a score, using the number scored out of three to show level of understanding.	
How to justify data:		Compare with pre questionnaire. Higher score indicates raised level of knowledge.	

Knowledge			
Question 2: Please circle the items that can be composted. If you aren't sure just move on.			
<p><b>Please note:</b> ZWE teaching focus for this question is based on whether or not the item is 'organic'. This is meant to be a basic explanation as to not confuse students. However, technically rubber bands and plastics are considered organic due to a presence of carbon compounds (Merriam Webster, 2013). Therefore, the scoring on this question is determined by how <b>easily</b> these items break down into nutrients that you would want to put on your plants.</p>			
Response		Score	Justification and reference
A	Wet Grass Clippings	1	" It is created by: combining organic wastes (e.g., yard trimmings, food wastes, manures) in proper ratios into piles, rows, or vessels; adding bulking agents (e.g., wood chips) as necessary to accelerate the breakdown of organic materials" (EPA, 2013). From the ZWE lesson: "You can't just put any of our waste in a compost bin. The type of waste you can put into a compost is organic." (ZWE, 2012a, p.3). Easy to break down.
B	Cardboard	1	" It is created by: combining organic wastes (e.g., yard trimmings, food wastes, manures) in proper ratios into piles, rows, or vessels; adding bulking agents (e.g., wood chips) as necessary to accelerate the breakdown of organic materials" (EPA, 2013). From the ZWE lesson: "You can't just put any of our waste in a compost bin. The type of waste you can put into a compost is organic." (ZWE, 2012a, p.3). Easy to break down.
C	Rubber Bands	0	Not a material that will easily break down.

D	Coffee Grounds	1	" It is created by: combining organic wastes (e.g., yard trimmings, food wastes, manures) in proper ratios into piles, rows, or vessels; adding bulking agents (e.g., wood chips) as necessary to accelerate the breakdown of organic materials" (EPA, 2013). From the ZWE lesson: "You can't just put any of our waste in a compost bin. The type of waste you can put into a compost is organic." (ZWE, 2012a, p.3). Easy to break down.
E	Dried Grass Clippings	1	" It is created by: combining organic wastes (e.g., yard trimmings, food wastes, manures) in proper ratios into piles, rows, or vessels; adding bulking agents (e.g., wood chips) as necessary to accelerate the breakdown of organic materials" (EPA, 2013). From the ZWE lesson: "You can't just put any of our waste in a compost bin. The type of waste you can put into a compost is organic." (ZWE, 2012a, p.3)
F	Plastic Bottles	0	Not a material that will easily break down.
G	Egg Shells	1	" It is created by: combining organic wastes (e.g., yard trimmings, food wastes, manures) in proper ratios into piles, rows, or vessels; adding bulking agents (e.g., wood chips) as necessary to accelerate the breakdown of organic materials" (EPA, 2013). From the ZWE lesson: "You can't just put any of our waste in a compost bin. The type of waste you can put into a compost is organic." (ZWE, 2012a, p.3). Easy to break down.

H	Banana Peels	1	" It is created by: combining organic wastes (e.g., yard trimmings, food wastes, manures) in proper ratios into piles, rows, or vessels; adding bulking agents (e.g., wood chips) as necessary to accelerate the breakdown of organic materials" (EPA, 2013). From the ZWE lesson: "You can't just put any of our waste in a compost bin. The type of waste you can put into a compost is organic." (ZWE, 2012a, p.3). Easy to break down.
I	Plastic Wrap	0	Not a material that will easily break down.
J	Tin Cans	0	Not a material that will easily break down.
<p>Use of data: Determine if composting knowledge has raised.</p> <p>How to display data: Display as a score, using the number scored out of ten to show level of understanding. Highest score will be 6.</p> <p>How to justify data: Compare with post questionnaire. Higher score indicates raised level of knowledge.</p>			

Awareness/Participation			
Question 3: How do you dispose of your food scraps at home? Circle all letters that apply.			
Response		Score	Justification and reference
A	Put them in the rubbish bin	1	If student circles this, they are aware of their home waste management practices.
B	Put them in the compost bin	1	If student circles this, they are aware of their home waste management practices
C	Put them in the worm farm	1	If student circles this, they are aware of their home waste

			management practices
D	Give them to the chickens	1	If student circles this, they are aware of their home waste management practices
E	Other:	0-1	0 - If the answer is I do not know 1- If the answer is a legitimate way to dispose of food scraps.
<p>Use of data: Determine if the student is aware of any food scrap disposal at home and what they practice.</p> <p>How to display data: Display as a graph, pre and post.</p> <p>How to justify data: Compare with pre questionnaire.</p>			

Knowledge			
Question 4: Rubbish that is collected from your house gets put in the ground in a landfill. What do you think happens to food scraps in a landfill? Circle all letters that apply.			
Response		Score	Justification and reference
A	Nothing, it stays the same.	0	"The organic waste turns to leachate and methane gas." (ZWE, 2012a). By stating rubbish stays the same they are not demonstrating knowledge of this fact.
B	It produces leachate	2	"The organic waste turns to leachate and methane gas." (ZWE, 2012a).
C	Worms eat it	1	"air is squashed out of a landfill, it's sealed making it hard for worms and bugs to get in." (ZWE, 2012a). Less of a correct answer than B and D as in the lesson, more emphasis is on production of

			leachate and methane gas.
D	It produces methane gas	2	"The organic waste turns to leachate and methane gas." (ZWE, 2012a).
Use of data:		Determine if children are aware of leachate and methane gas as a by-product of organics going into landfill.	
How to display data:		Display as a score, using the number scored out of five.	
How to justify data: Compare with pre questionnaire. Higher score indicates raised level of knowledge.			

Knowledge			
Question 5: What could you use finished compost for? Please circle all that apply.			
Response		Score	Justification and reference
A	Use it as mulch	1	"Compost can be used as a mulch" (Wilson, Feicht, 2013).
B	Dig it into the garden	1	"Areas planted every year, such as vegetable or annual flower Gardens, can accept frequent applications of compost." (Wilson, Feicht, 2013).
C	Put it in the rubbish	0	"This is how the course works. We want people to start composting more so we can reduce the amount of waste we send to landfill" (ZWE, 2012). The point is to divert rubbish.

D	Put it around tree drip lines	1	"Explain that we can feed a tree with compost by mixing the compost with water and watering the tree, or by filling a trench with compost so when it rains the water dilutes the compost and the roots absorb the compost" (ZWE, 2012).
Use of data:	Determine if children understand what compost can be used for.		
How to display data:	Display as a score, using the number scored out of three.		
How to justify data:	Compare with pre questionnaire. Higher score indicates raised level of knowledge.		

Skills/Participation			
Question 6: How comfortable do you think you would be showing your parents how to make good compost? Please circle your answer.			
Response		Score	Justification and reference
A	I wouldn't know how to	0	Child does not feel he/she has the skills to show family how to make compost yet.
B	Yes I could try	1	Child is developing skills to show family how to make compost
C	No problem, it would be easy!	2	Child feels completely comfortable showing family how to make compost. "Children will build their own 'mini-compost' (containing tiger worms), giving them the skills and knowledge to build and

			maintain large scale composts at home and/or school" (ZWE, 2012b).
Use of data:	Determine if children feel expert enough in their compost knowledge to take action at home.		
How to display data:	Display as a score, using the number scored out of two		
How to justify data:	Compare with pre questionnaire. Raised score indicates development of skills and participation towards targeting the issue.		
Attitudes			
Question 7: How important do you think composting is? Please circle your answer. Response			
A		Score	Justification and reference
B	Not at all important	0	Child does not show attitude of general concern.
C	A little bit important	1	Child is developing an attitude of concern.
Use of data:	Very important	2	ZWE compost unit achievement objective: "Understand that people have social, cultural, and economic roles, rights, and responsibilities." (ZWE, 2012b). By understand the importance of composting children are making the connection between composting and social responsibility.
How to display data:	Determine if children feel composting is important.		
How to justify data:	Display as a score, using the number scored out of two		
Attitudes			
Question 8: Can you explain why you feel this way?			



		Score	Justification and reference
	Varied responses showing no concern or understanding of the importance of composting.	0	Child does not show attitude of general concern.
Use of data:	Varied responses showing concern or understanding of the importance of composting.	1 to 2	ZWE compost unit achievement objective: "Understand that people have social, cultural, and economic roles, rights, and responsibilities." (ZWE, 2012). By explaining the importance of composting children are making the connection between composting and social responsibility. Score is determined on how genuine the concern seems. 1 would be a little bit of concern, 2 would be lots of concern with some sort of justification. Specifically, if the response is along the lines of "it helps the earth" or "the worms like it", this will be a 1. Looking for knowledge of reducing waste, recycling nutrients, leachate,etc.
How to display data:	Determine if children feel if composting is important and their reasoning behind their decision. Also internal evaluation for evaluator to compare child’s response to this question with other questions to see if their ideas here concur with other answers throughout the questionnaire.		
How to justify data:	Display as a score, using the number scored out of two		
	Compare with pre questionnaire. Raised score indicates attitudes of concern.		
Attitudes/Participation			
Question 9: I intend to go home and help make a compost bin with my family. Response			
A		Score	Justification and reference
B	No	0	Child shows no indication of attitudes of concern

			or willingness to participate towards resolving the issue.
C	Maybe	1	Child beginning to show indication of attitudes of concern or willingness to participate towards resolving the issue.
D	Yes	2	Child shows indication of attitudes of concern or willingness to participate towards resolving the issue.
Use of data:	We have one already	0	Indication of attitudes of concern or willingness to participate towards resolving the issue not able to be justified. A zero here is not negative, it is simply beyond measurement.
How to display data:	Determine if children feel composting is important.		
How to justify data:	Display as a score, using the number scored out of two		
	Compare with pre questionnaire. Reporting only to be done on children with no compost at home.		
Attitudes/Participation			
Question 10: I feel that everyone should compost their food scraps. Response			
A		Score	Justification and reference
B	No	0	Child shows no indication of attitudes of concern towards the issue.
C	Maybe	1	Child beginning to show indication of attitudes of concern towards the issue.
Use of data:	Yes	2	Child shows indication of attitudes of concern towards the issue.
How to display data:	Determine if children feel composting is important.		

How to justify data:		Display as a score, using the number scored out of two	
		Compare with pre questionnaire. Higher score is indication of development of attitudes of concern towards the issue.	
Attitudes/Participation			
Question 11: Have you discussed anything you have learned from going through the waste programme at home with your parents or caregivers? Response			
A		Score	Justification and reference
B	No	0	Child has not shared the issue with parents, no intergenerational transfer. Intergenerational transfer is a process “whereby school students act as catalysts of environmental change among their parents and other community members” (Ballantyne, Connell, & Fien, 1998, p. 286).
C	Yes a little	1 to 2	Child feels that they have told their parents a little about their knowledge. Intergenerational transfer is happening, however they do not feel that they have shared 'a lot' of information. Therefore this is a lower score than a child who feels they have told their parents 'a lot', showing more of an attitude of concern.
Use of data:	Yes, a lot	1 to 2	Child feels that they have told their parents a lot about their knowledge and the issue.

			Intergenerational transfer would appear to be happening.
How to display data:	Determine if children feel composting is important and are willing to share the message to parents and act as a catalyst of environmental change.		
How to justify data:	Display as a score, using the number scored out of two		
Higher score shows higher level of intergenerational transfer. Before scoring, compare with question 12 to determine the level of concern towards the issue that appeared to be taken home.			
Attitudes/Participation			
Question 12: . If yes, what did you tell them about? Response			
		Score	Justification and reference
	Blank & Letter A circled on question 11.	0	Child has not shared issue at home with parents.
Use of data:	Varied Responses.	1 to 2	Child feels that they have told their parents about their knowledge. Intergenerational transfer is happening. Score as a 1 or 2 depending on depth of what has been shared. Simple facts - 1. Importance and effects - 2.
How to display data:	Determine if children feel composting is important and are willing to share the message to parents and act as a catalyst of environmental change.		
How to justify data:	Display as a score, using the number scored out of two		
Higher score shows higher level of intergenerational transfer.			
Attitudes towards programme			
Question 13: How much fun was the Zero Waste programme? Response			
A		Score	Justification and reference
B	Not at all fun	0	Negative attitude towards programme, shows little engagement.

C	A little bit fun	1	Mediocre attitude towards programme.
Use of data:	A lot of fun	2	Positive attitude towards programme. Shows engagement.
How to display data:	Determine if children feel programme is fun and engaging.		
How to justify data:	Display as a score, using the number scored out of two		
	Higher score shows higher level of engagement.		
Attitudes towards programme			
Question 14: Did you enjoy the way that Renee taught you about composting? Response			
A		Score	Justification and reference
B	Not at all	0	Negative attitude towards educator, shows little engagement.
C	A little bit	1	Mediocre attitude towards educator
Use of data:	A lot	2	Positive attitude towards educator. Shows engagement.
How to display data:	Determine if children feel programme/educator is fun and engaging.		
How to justify data:	Display as a score, using the number scored out of two		
	Higher score shows higher level of engagement.		
Attitudes towards programme			
Question 15: Please explain why you liked or did not like how Renee taught you about composting. Response			
		Score	Justification and reference
	Varied negative responses	0	Negative attitude towards educator, shows little engagement.
Use of data:	Varied positive responses	1	Mediocre/positive attitude towards educator shows engagement.
How to display data:	Determine if children feel programme/educator is fun and engaging.		
How to justify data:	Display as a score, using the number scored out of one.		
	Higher score shows higher level of engagement.		
Attitudes towards programme			
Question 16: How did you feel about learning about composting?			

Response			
A		Score	Justification and reference
B	It was boring	0	Negative attitude towards programme shows little engagement.
C	It was okay	1	Mediocre attitude towards programme
Use of data:	It was very interesting and fun	2	Positive attitude towards programme. Shows engagement.
How to display data:		Determine if children feel programme delivery is fun and engaging.	
How to justify data:		Display as a score, using the number scored out of two	
		Higher score shows higher level of engagement.	
Knowledge/Skills			
Question 17: Overall, do you feel your knowledge of composting and waste has improved during this programme?			
Response			
A		Score	Justification and reference
B	No I haven't learned anything	0	Student does not feel they have learned new information through the programme.
C	I didn't learn much	1	Child feels they have developed their learning, but some knowledge was facts they already knew
Use of data:	YES, I learned a lot	2	Student feels they have learned a lot of new information regarding composting and waste.
How to display data:		Determine if children feel content of programme was new knowledge they had not encountered previously, and that they have a lifted level of composting knowledge.	
How to justify data:		Display as a score, using the number scored out of two	
		Higher score shows learning is relevant to learners and that information learned through programme was new information for students.	

## Appendix N: Parent Questionnaire Question Analysis

Intergenerational Transfer			
Question 1: How much has your child shared with you about their learning in the Zero Waste Education programme at school?			
Response		Score	Justification and reference
A	Nothing at all	0	Nothing has been shared. No intergenerational transfer
B	Not much	1	Very little has gone home
C	A little bit	2	Some information has gone home
D	A lot	3	Lots of information has gone home
Use of data:	Determine if any intergenerational transfer has occurred		
How to display data:	Display as a score, using the number scored out of three to show how much of the message got home		
How to justify data:	Compare with question 4		

Attitudes/Intergenerational Transfer			
Question 2: Has that surprised you at all?			
Response		Score	Justification and reference
	No, varied responses	0	If parent is not surprised by the amount of information that the child has shared then it could be said that the child shares information about school.
	Yes, varied responses	0 to 1	If parent is surprised then it can be said that the child has developed attitudes towards fixing the issue, 1. If the parent is surprised that the child has not shared much, and they usually do share information, that is a 0.
Use of data:	Determine if child has developed attitudes towards the issue.		
How to display data:	Display as a score.		
How to justify data:	Adds to bigger picture of the evaluation story.		

Intergenerational Transfer			
Question 3: Has your child mentioned any ideas or points of interest that they have learned in the Zero Waste Education programme?			
Response		Score	Justification and reference
A	Not at all	0	Nothing has been shared. No intergenerational transfer
B	Not much	1	Very little has gone home
C	A little bit	2	Some information has gone home
D	A lot	3	Lots of information has gone home
Use of data:		Determine if any intergenerational transfer has occurred	
How to display data:		Display as a score, using the number scored out of three to show how much of the message got home	
How to justify data:		Compare with question 4 and 1	

Intergenerational Transfer			
Question 4: If yes, what did your child discuss with you?			
Response		Score	Justification and reference
	Blank	0	Child has not shared anything/parent did not want to answer.
	Varied responses	0 to 1	Responses will be varied. 1, child shares information that the parent can use to compost. This will be evidence of intergenerational transfer. 0, the information shared is not related to taking action at home on composting/waste reduction.
Use of data:		Determine what information children took home.	
How to display data:		Use to create picture of what messages went home.	
How to justify data:		Triangulate with questionnaire responses.	



Intergenerational Transfer			
Question 5: Did your child talk to you about ways to reduce the amount of rubbish that your household produces?			
Response		Score	Justification and reference
A	Not at all	0	Nothing has been shared. No intergenerational transfer
B	Not much	1	Very little has gone home
C	A little bit	2	Some information has gone home
D	A lot	3	Lots of information has gone home
Use of data:		Determine what information children took home.	
How to display data:		Display as a score, using the number scored out of three.	
How to justify data:		Compare with question 6.	

Intergenerational Transfer			
Question 6: If yes, what did they say?			
Response		Score	Justification and reference
	Blank	0	Child has not shared anything/parent did not want to answer.
	Varied responses	0 to 1	Responses will be varied. 1, child shares information that the parent can use to compost. This will be evidence of intergenerational transfer. 0, the information shared is not related to taking action at home on composting/waste reduction.
Use of data:		Determine if children feel expert enough in their compost knowledge to take action at home.	
How to display data:		Use to create picture of what messages went home.	
How to justify data:		Triangulate with questionnaire responses, compare with question 5.	

Attitudes/Participation			
Question 7a: Have you noticed any change in your child's interest or awareness around responsible waste practices at home e.g. disposal/reduction since they have gone through the programme?			
Response		Score	Justification and reference
A	Not at all	0	No observation of awareness/participation.

B	Not much	1	Very little has awareness/participation.
C	A little bit	2	Some awareness/participation
D	A lot	3	Lots of awareness/participation
Use of data:		Determine if children are putting to practice their learning.	
How to display data:		Display as a score, using the number scored out of 3 .	
How to justify data:		Numbers above 0 signify that children are taking action at home.	

Intergenerational Transfer			
Question 7b: Comment			
Response		Score	Justification and reference
	Parents may have commented.		
Use of data:		Further create a picture for the evaluation with specific examples of action taken.	
How to display data:		In findings chapter	
How to justify data:			

Intergenerational Transfer			
Question 8a: Since your child has gone through the Zero Waste Education programme, have any of your household waste practices changed? If so, please comment on how they have changed.			
Response		Score	Justification and reference
A	Not at all	0	Nothing has been shared. No intergenerational transfer
B	Not much	1	Very little has changed. Still evidence of intergenerational transfer.
C	A little bit	2	Some changed have occurred. Evidence of intergenerational transfer.
D	A lot	3	Lots of changes have happened. Evidence of intergenerational transfer.
Use of data:		Determine if children have sparked a change in their household.	

How to display data:	Compare with 8b. Use to create the picture for evaluation.
How to justify data:	Compare with 8b.

Intergenerational Transfer			
Question 8b: Comment			
Response		Score	Justification and reference
	Parents may have commented.		
Use of data:	Further create a picture for the evaluation with specific examples of action taken.		
How to display data:	In findings chapter		
How to justify data:			